DOCUMENT RESUME

ED 112 843 IR 002 547

AUTHOR Hutcheson, Donna, Ed.
TITLE Proceedings of the Computer Users Conference (East Texas State University, Commerce, Texas, March 13, 1975).
INSTITUTION East Texas State Univ., Commerce.
PUB DATE 13 Mar 75
NOTE 100p.

EDRS PRICE MF-$0.76 HC-$4.43 Plus Postage
DESCRIPTORS Computer Programs; *Computers; Computer Science Education; *Conference Reports; Data Collection; *Electronic Data Processing; Information Systems; Input Output Devices; Management; On Line Systems; Personnel Management; Professional Training
IDENTIFIERS *Computer Users; Data Base Management

ABSTRACT

This report from the first Computer Users Conference is organized around the four panel discussion topics: data collection, data preparation and presentation, data base management, and overall management of hardware, software, people and data. On each panel were two industrial data processing experts who presented papers for discussion. These papers are included in the report. Discussions of the papers by the industry representatives, an academic chairman for the panel and two academic data processors were transcribed and edited for inclusion in the report. The overall aim of the report is to share information, techniques, and needs between the computer industry and the academic computer science community. (CH)

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PROCEEDINGS OF THE
COMPUTER USERS CONFERENCE
MARCH 13, 1975

EAST TEXAS STATE UNIVERSITY

IR002817

PROCEEDINGS OF THE
COMPUTER USERS CONFERENCE

East Texas State University
Commerce, Texas 75428

March 13, 1975

Sponsored by

Computer Science Department, East Texas State University
Blue Cross/Blue Shield of Texas
Electronic Data Systems
International Business Machines
Southland Life Insurance Company
Texas Power and Light Company

Edited by

Donna Hutcheson
Computer Science Department
East Texas State University

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EDITOR'S PREFACE

On March 13, 1975 the first Computer Users Conference was held at East Texas State University to provide an opportunity for all interested computer science students and educators from educational institutions to meet with industry data processing executives from around the state. Both industry and academic representatives discussed their needs, problems, and future desires in the area of computer technology.

The format of the conference consisted of four panel discussions on selected topic areas each lasting one and one-half hours. Each panel consisted of an academic chairman, two industrial data processing leaders and two academic data processors. The industrial panelists presented papers discussing current thoughts in industry concerning the topic in question. The academic panelists served as catalysts for questions about the papers and presented the university approach to the topic. The papers and all associated discussion are presented in this volume of Proceedings of the Computer Users Conference.

By the agreement of conference participants, I transcribed and edited the discussion portions of the Proceedings from tape recordings made at the Conference. As a consequence, the dialogues reported in this book are my interpretations of what the participants said. If I inadvertently misunderstood, misinterpreted, or distorted anyone's remarks, I deeply apologize.

Many long hours of work went into making this Computer Users Conference a success. As the conference Chairman, I would like to thank the Panel Chairmen, the industry sponsors, the authors of the papers, the official panel speakers, and all of the many participants from both education and industry who responded to our invitation to actively participate in the Conference. As Editor of the Conference Proceedings, I would like to express my indebtedness to Jo Anne Wall, Computer Science Department Secretary, and Jan Spry, Student Assistant, for their invaluable assistance in typing for both the Conference and Conference Proceedings.

The following people deserve special thanks and recognition: Robert L. Smith, Jr., Blue Cross/Blue Shield of Texas, for his guidance and comments during the planning and implementation; Alton Goddard, Head, Department of Computer Science, East Texas State University, for his steadfast patience, encouragement, and assistance from the inception of the Conference idea through the publishing of proceedings; and lastly, Larry Hutcheson for his unfailing moral support and understanding.

Once again, thanks to all of you who helped to make the first Computer Users Conference a success.

Donna Hutcheson
Conference Chairman

DATA COLLECTION PANEL

Panel Chairman: Al Stehling
Chairman of Data Processing Department
San Antonio College
San Antonio, Texas

Introduction

Stehling: The topic of our session is data collection. Data is meaningful information put into the computer system so we can get meaningful output. Data collection is the capturing of this meaningful information.

Data collection can be classified as direct data collection and indirect data collection. Indirect data collection means that data is captured on some form of source document. Before we can use the data, however, it must be transcribed into machine readable form. Direct data collection can be on-line or off-line.

Off-line means data is captured at the time of a transaction in punched cards or tape, and accumulated into a batch for input to the system at a convenient time. On-line means that as a transaction occurs, data is captured and fed directly into the computer so that we can get some type of feedback. Our speakers will address both direct and indirect data collection, even though they may not call them by those names.

CRT DATA ENTRY UNDER A DATA BASE MANAGEMENT SYSTEM

Carolyn Meyer, CDP
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Computer Services Division
United Services Automobile Assn.
San Antonio, Texas

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INTRODUCTION

In a commercial environment today, everyone is highly concerned with double-digit inflation. Increasing productivity is one significant means of offsetting rising expenses. Today more than ever before, productivity is being recognized as a basic measure of economic progress. Of all the tools that have been developed to help us with our work, few possess the computer's potential for contributing to productivity. Data entry techniques particularly, can be used very effectively to increase the productivity in a commercial environment. Source data entry is everyone's goal, including ours. Combine it with job consolidation and you are truly maximizing the computer's potential for contributing to productivity.

USAA ENVIRONMENT

USAA is primarily a property, casualty, and life insurance writer. We have no agents in the field. We are a centralized home office operation based in San Antonio, Texas with 5 regional service offices. We receive 50,000 pieces of incoming mail and 3,250 long distances calls per day from 1 million active customers. These high daily volume figures make effective data entry techniques highly important. We utilize two basic methods of data entry, centralized and decentralized.

CURRENT DATA ENTRY

Centralized Data Entry Operation - (Source Data Entry)

Optical Character Reader - (OCR). In our Incoming Mail department, mail is opened and sorted by type. Turnaround billing stubs are given top priority handling and routed immediately to the reader. The OCR device reads both numeric computer printed data as well as numeric hand printed data. Currently we receive about 22,000 returns per work day. The advantage of OCR source data entry in this case meant a big increase in productivity as well as improved cash flow since the incoming checks now go to the bank the next morning.

On-Line CRTs. All other customer mail is routed through a bank of sixty CRT operators in the Incoming Mail department. The mail is read and analyzed at this point. A special inquiry display of the pertinent information from the customer data base is used for this purpose. Any customer biographical data that is to be initially entered or updated is keyed on-line and posted to the on-line customer data base immediately. The operator then routes the mail to the proper operations division to service the mail request.

This is an example of source data entry, as well as job consolidation. Previously the mail was read, analyzed and routed by a mail analyst before it was matched by a CRT operator against the customer data base, who marked the changes/additions to be keyed by a 3rd person.

Decentralized Data Entry Operation

Key-to-Tape. All other operating divisions are currently using 120 key-to-tape devices for entering data. These devices are staffed and trained by user personnel. A formatless keying technique is used to minimize key strokes. The data reels are routed to Computer Services, pooled at end of day, and posted to all master files at night.

CRT On-Line Data Entry System - (CODES).

1. General Description. We have developed a CRT on-line data entry utility which operates under the control of a data base management system. The initial development is complete and we are currently servicing a limited amount of production keying.

Its primary function is to accept data in its source document format, perform preliminary field edits and reformat the data into records compatible with the various USAA application systems. Data keyed through this system can be transmitted directly to our computer center from both local and remote sites.

We use a formatted technique or fill-in-the-blank visual display. The screens are arranged in source document sequence so that the customer or user does not have to design documents to fit the constraints of computer programs.

The preliminary field edits include the normal numeric or alpha checks, table look-ups, high low ranges, and check digit routines. In addition, entry in mandatory fields, groups of fields or even pages within a document are required. After documents have passed the editing criteria, they are immediately routed to other on-line systems, or they can be retained for batch processing.

At the end of the day, management reports are produced which reflect data entry operator productivity and transaction volume by type. These statistics are available on-line or in hard copy form.

2. Technical Overview. This utility is table or library driven. It was designed to facilitate the implementation of new applications without modifications to the utility program. The edit criteria is compiled from

English language type commands and is transparent to the program. The user supplies the format sequence and the data element definitions. The format and edit libraries are maintained by Computer Services Data Entry Librarians.

3. Short Term Goal & Benefits. Our immediate goal for developing CODES was to replace the key-to-tape devices with a more productive and timely data entry technique. Productivity increases resulted from these techniques:

a. Meaningful Field Headers -
Benefit - Reduces operator training by eliminating the need to memorize the sequence of the data fields.

b. Formatted Screens Sequenced To Match The Source Document -
Benefit - Increases the accuracy of the initial keyed data as input to USAA batch systems, due to simplified entry.

c. Sight Verification -
Benefit - Reduces key strokes by 50% due to the elimination of key verification.

d. Immediate On-Line Editing of Each Page -
Benefit - Reduces the number of transactions rejected during the batch processing, which would otherwise have to be re-handled and re-keyed at a later date.

Net Data Entry Projected Productivity Gain:

a. 30% reduction in keying personnel based on a 3-5 second on-line response per page.

b. 80% reduction in time to train data entry operator.

c. Elimination of manual handling, routing, and pooling of 120+ reels of tape each work day.

4. Mid-Term Goals. Our mid-term goals are to:

a. Combine the insurance analysis of a customer's request with the related coding and data entry steps into one consolidated job.

b. Decentralize CRT data entry to source points, including regional service offices.

FUTURE DATA ENTRY REQUIREMENTS - 1980's

Objectives

1. 100% source data capture of all incoming mail.

2. Average one day service time response from mail in to mail out.

3. Comprehensive job consolidation.

General Technology Requirements

Future data entry will require an advanced, sophisticated, cohesive system composed of new OCR hardware, Data Base Management Software, and CRT devices.

Detail Technology Requirements

OCR Hardware. The ability to capture all incoming paper immediately and generate a work-pending image data base by type of work will be made possible by the new OCR hardware.

Data Base Management Software. A software system that will read the image copy and develop a pending digital data base in the same sequence as the image data base with a cross index will be needed.

CRT Devices. Each CRT work station will permit concurrent:

1. Display of:
    a. Both the pending image record and the extracted digital record to permit verification of the accuracy of the image technology capture.
    b. Current master file digital data base record.
    c. Text procedures when needed for reference.
2. Keying of the necessary transaction data.
3. Review of:
    a. Updated digital master file record.
    b. Resulting formatted document image for verification before printing.

Operation Concept

Multi-Split CRT workstations staffed with general insurance analysts will handle incoming telephone calls and/or queued up mail image work pending as one consolidated job. When the transaction processing is completed, image copies of incoming mail and output documents will go out on computer output microfilm for historical storage and record retention purposes, assuming laws will permit. Output document records going to the customer will be batched and printed periodically and released directly to outgoing mail. No paper output will be generated except to print the required documents to be mailed to the customer.

Benefits

The benefits are obvious and staggering:

1. Tremendous increase in productivity via one person processing.
2. Dramatically improved customer service time.
3. Significantly reduced paper usage.
4. Overall reduction in overhead & operating costs.

Result

The net result, when attained, will be a highly efficient internal paperless insurance company and a highly effective customer service operation!!

Panel Discussion

J. F. Dreussi, Instructor
Computer Science Department
University of Texas at San Antonio
San Antonio, Texas

Dreussi: Academic communities have a great deal of trouble obtaining equipment, even a teletype, and large companies like USAA have 120 or more CRT's, and other expensive equipment. Carol, can you tell us of any cost study that has been conducted on the cost of buying equipment versus having the people in the three stages of data handling. Sometimes companies get sold a bill of goods by the salesman in that if you buy this equipment you can do away with all the people and reduce your cost overhead.

Meyer: Yes, I can comment on that. One, the key-to-tape data entry is very inexpensive in that we bought the devices and have had them approximately eight years, so it is a very economical way to enter data. However, it does not provide us with the advantages that I outlined in the speech. In our case, the computer salesman did not do the selling; we did. We presented a five-year data-processing study to the president in 1970. It was approved and his direction was to look at things in the long range as far as cost justification and not just the immediate benefits. For those of you that have been in industry for any length of time realize that you live with the computer system or at least the design of it for 15 years. If you are going to live with it that long, you should give quite a bit of thought to what you can live with for that long. So we decided where we wanted to go, which was the one step job consolidation that I described. The on-line data entry is just the first step in that direction. We are trying to do an evolutionary building block approach to that long range objective. The cost today for that system versus the key-to-tape is going to cost more money. We feel in the long run, though, it will pay off, because we will finally reach that goal of one step job consolidation.

Dreussi: One of the things that people in artificial intelligence are looking at is character recognition by machine. Your paper says that your OCR reads both numeric and hand printed data. More specifically, I am interested in what kind of character recognition capabilities are the OCR units going to have in the future. Will you be able to recognize my long hand if it comes in?

Meyer: I cannot go too far into that for I am not an expert in that area. Also, we are bordering on the capabilities which have not been announced. However, as we understand it, the OCR equipment technique is moving in the direction where it can take a letter, for example, and actually record through the process of matrix (black, white, and gray) reproduction, actually record a picture of that document on magnetic devices. Later, it would come back to a CRT device, much like on your TV screen, and will be depicted in a similar manner. So it will pick up what it sees and will show you what it sees. What is even more intriguing is how the software and related application code is going to take what it sees and develop a digital data base from it. That is the reason you need the split screen capability or the superimposed capability. So the first thing an operator can do is look at what came in and what this software developed as transaction data and see if there is anything wrong with it.

In your question, you mentioned the numeric hand print. Presently on the OCR equipment, if you were to leave a 5 open at the top, as the beam scans around that number to identify it, it will not recognize it as a 5. It may cause character substitution or it may say this is a reject and I can't handle it.

Dreussi: Will it make a guess?

Meyer: No, not unless you have written a routine that, given a check digit on that field, it can develop the number it can't read. Now there is a risk factor in that if there are two digits it can't read, it may develop the wrong number.

Dreussi: Could you tell us something about how the English-type commands, you feel, will help train the operators versus using nnemonics that systems people are so crazy about. It seems training operators would be easier if they could associate what they are keying with something they are familiar with, like English, rather than the systems language that only systems programmers are familiar with.

Meyer: From a data entry operator's point of view, we are moving in the direction of getting away from coded data. For instance, instead of keying in the state of Texas as a code 42, the operator would actually key in TX. As our company moves more and more applications onto the CRT data entry using the meaningful headers, the data entry operator will no longer have to memorize the sequence of data. Since the headers are more meaningful to her, she doesn't have to memorize and use codes.

Your other question had to do with how we maintain those libraries using English-like commands. Maintaining those libraries for us is a two step process. One is a data dictionary system which we purchased and are using. It is set up so that we can take a person who is not a programmer, and through meaningful macros, if you will, teach her how to update those libraries, both the edit criteria which goes into the dictionary and then the screen formats themselves. The screen formats go through IBM software that is related to the information management system.

Dreussi: Do you have a little CAI system? Is that what that is?

Meyer: No, we don't at this time, but I understand that there is now a package available that runs under IBM's interactive training system which runs under IMS. So maybe in the future, we will have that.

Dreussi: It appears to me that once you get the entire design implemented, the company is going to be totally dependent on your computer operation services. What kind of reliability do you expect from your equipment? What kind of back-up reliability and what kind of protection are you going to have on your data bases from say malicious or other type of misuse?

Meyer: That is a heavy question. Currently, as far as reliability is concerned, I would say that for the last six years we have been dependent and now are totally dependent on the on-line system. It is the only source for customer name and address in the building. You cannot go get an up-to-date paper document or look it up anywhere else. I would say in the last six years, we have only been down one time where we lost a whole day's worth of work. When that does happen, our incoming mail department comes to a stop for all practical purposes and the branches of the other user divisions do not receive any mail. They continue to receive telephone calls and they can handle that to a certain extent without the on-line inquiries because they did it like that in the past. We cannot provide as comprehensive service without the inquiries, but we can take down the information.

As far as the future equipment, obviously I do not know at this time how reliable that equipment will be. However, our approach would be to try to validate its reliability through the initial users that have brought the equipment in and have it running. If it looks fairly stable to us then we would bring it into the development phase. If we had a great deal of trouble with the reliability, we would probably stop right there, because you are right, the whole company operation would be dependent on it. The third thing would be that we would probably back up with duplicate hardware every piece of the equipment that was economically feasible. If one was extremely expensive to back-up, we would have to weigh the cost of being down a day to the company versus the cost of backing up that one piece of equipment.

DATA COLLECTION
EQUIPMENT AND TECHNIQUES

Robert M. Hackett, CDP
Director Systems and Procedures Department
Consolidated Data Processing Center
City Water Board
San Antonio, Texas

The San Antonio City Water Board operates the Consolidated Data Processing Center, which was created in 1961 by the consolidation of the data processing departments of the City of San Antonio and the City Water Board. By 1974 service was provided to twelve City Water Board departments, eighteen City of San Antonio departments, five other tax-supported entities and two title companies who may request information from the tax files. In addition, the Criminal Justice Information System serves nine Bexar County departments and the San Antonio Police Department. The center operates two IBM System/370, Model 145 computers on a twenty-four-hour, seven-day-a-week basis. These computers, with three-quarters of a million bytes of storage each, work in the virtual storage environment of OS/VSI. Twenty spindles of 3330 direct-access storage are required to serve the teleprocessing-oriented users. Although on-line storage is shared by the computers, the teleprocessing systems are configured so that terminal updates to a specific file can be made only through one of the central processing units.

The way in which the teleprocessing systems intertwine with the day-to-day work of many of the users means that computer malfunctions must be minimized. The two-computer configuration, instead of one larger one, is used to provide the capability of continuing service during an extended computer failure. Presently, portions of the teleprocessing system are served by each computer, but the complete system can be quickly switched to one or the other if the need arises. This is accomplished with a multiplexer channel switch dividing the terminal groups between the computers. The first group can be categorized as the "business office" group which supports two 3272 local control units and a 2701 Data Adapter to serve two 3271 remote control units and three 2740 terminals. This group controls the terminals for the City Water Board and the City of San Antonio business activities. The second group serves the criminal justice community, both City and County, using four 3272 local control units and a 2701 Data Adapter to support the South Texas Regional Message Switcher. At the end of 1974, seventeen users operated 120 cathode ray tube display terminals and forty-two printers to aggregate 800,000 input transactions a month.

IBM, in its glossary of data-processing terms, defines data collection as "a telecommunications application in which data from several locations are accumulated at one location before processing." Data collection in the context of computer processing also includes the man-machine interface as data are translated into computer language. This facet starts in an office where clerks collect and edit data before conversion. A key-driven-machine operator should not be required to analyze information if satisfactory production is to be maintained. The operator must understand and be experienced in the conversion process but need not know what the data describes. This being true, any competent operator can convert any data when it has been properly identified. This is not to say that all data must be transcribed before it is converted, or that it must be collected and ordered. It can be accepted at random on any document as long as the information is reasonably easy to find and understand. In many instances, however, information for a record must be gathered from a variety of documents, and the effort to edit add identify it is much greater than that of transcribing it to a structured form.

The keypunch, in one form or another, has been in use more than eighty years and has developed from a brute-force key-driven machine to punch holes in a card equating to numeric information, to the electric alphanumeric keypunches of today. The IBM 129 used by the Center provides the ability to keypunch and then, in a separate operation, verify on the same machine. It stores the punch-control programs and uses a buffer to accumulate data to be punched. After keying has been completed, the data are punched from the buffer into a card. The Center uses the Model 129 for small-volume jobs ranging from a few to several hundred cards, but it uses key-tape equipment for the larger jobs.

The Mohawk key-to-tape equipment uses a keyboard similar to a keypunch but magnetic tape instead of cards as a recording medium. It too provides the ability to key and verify on the same machine. Records can be changed before or after they are written on tape. Besides increasing conversion speed, this equipment eliminates the cost of cards, permits more than eighty characters in one record (in certain instances) and, of course, assures the exact sequence of the records. A fixed sequence can be an advantage since much of the identifying information necessary when the data requires more than the equivalent of one card can be eliminated. The equipment provides output in the tape format of the computer and can be read at tape speed, which is much faster than cards can be read. One of the key-to-tape machines also doubles as a paper-tape reader which is used to record moving-violation-disposition information as it is punched by the cash registers used by the Municipal Courts cashiers. Another is used as a card reader primarily to read the fifty-one column circulation cards from the Public Library.

The punched stub "turnaround" document is used to record payments for water and sewer service and current taxes. The utility bills are printed on a continuous punch card form prenumbered and prepunched by the manufacturer. As the bills are printed, a cross-reference file is created that identifies the serial numbers with the account number and billing amounts. When the stub is presented for payment, the serial number is reproduced into a standard size card and fed into the computer to post payment information. The punched-stub procedure for tax billing is designed differently because tax collection requires a different type of procedure. Like the water bills, the tax bills are printed on continuous, prepunched card forms but the tax bills, after being detached, are further processed to punch into the stub the tax account number and amount due. This is more effective because, unlike water bills with their constant volume of processing, tax bills are prepared once a year and about 50% of the payments are received in a two-week period. Then too, mortgage bankers pay the bills in groups ranging from a few hundred to several thousand. These groups must be preaudited and balanced to the payment which is a simple process when the amount due can be read directly from the stub.

Water meter readings and information for several small systems are recorded using a mark sense punched card. This technique when used for gathering small amounts of numeric information permits the original recording of data in a machine-sensible form. A special pencil with lead that is an electical conductor is used to mark through specifically identified areas on the card. The IBM reproducer senses these marks and punches holes in the card to represent the information marked. The cards are then processed as punched cards. Although various portable electronic devices are available to perform the meter-reading function, none can match the mark sense card in economy and ease of use.

The data-collection methods discussed so far are used for batch processing with a fixed input schedule. Data are gathered into workable bathces, preaudited, processed, balanced and postaudited in these batches. This technique is suitable for the large volume of information where the need of obtaining the information in real time does not justify the cost of doing so. When cost is justified, the ability to add or change information at the terminal is provided.

It is important to point out that programming for terminal processing is such that only authorized personnel may view or change the information contained in over sixty on-line files. Tax Office personnel, for instance, can use only tax information and are unable to obtain payroll information. Every user has some update capability which is specifically defined and ranges from the entering of codes to update a single field to the updating of many fields of a record at one time. Where the more complicated update is required, a shell or format is displayed on the screen to guide the operator through the proper decisions. Because this happens very fast, editing is simple but sufficient to give the operator some help and a chance to try a second time.

The best example of a real-time system at the Center is the Criminal Justice Information System, which is operated for the City of San Antonio and the County of Bexar. This system is the user's system and except for programmatically authorizing displays and updating capability and the simple editing, the user may change data as he desires. One half of the terminals at the Center are used by this system and the several systems of the San Antonio Police Department. Batch update is not used since information is added through the terminals at the time it is developed. For example, when a subject is booked at the jail, this fact is made known immediately to the law-enforcement-identification office. An automatic check is made of outstanding warrants, and if any are found, the system directs this information to the appropriate function. The system has combined or associated the many files used by the criminal-justice community so that a single input will update the pertinent files. The South Texas Regional Message Switching computer provided by Action Communications Systems, Incorporated is an integral part of the Criminal Justice Information System. It is one of the two regional message switchers in the Texas Law Enforcement Teleprocessing Network and provides the local criminal-justice community with a direct connection to State and

National files. Authorized users employ the local CRT terminals to obtain information from State files concerning driver's records, vehicle registrations, and that information available from the Texas Crime Information Center. When appropriate, the State computer system at the Department of Public Safety automatically routes the messages to the National Crime Information Center. The users have the option, with one request, of obtaining data from a single source or several sources. Responses are normally routed to a 3286 printer which solves the problem of controlling arrival sequence.

The City Water Board owns an IBM 1800 Process Control computer which collects data for the control of the Central Heating and Cooling Plant and the water-distribution system. Built to provide steam and chilled water for HemisFair '68, the plant also houses the centralized control center of the water-distribution system. Information is collected in analog form to either monitor or control a process using various types of transducers that change the value of an electrical current in proportion to the change of what is measured. An example is a thermocouple that measures the temperature of a chiller-motor bearing by increasing the electrical flow as the temperature increases. This signal is converted every few seconds to an engineering valve representing the bearing temperature in digital form. It is compared with the established parameters and, if outside them, will take remedial action. This may be to increase the flow of coolant or, in extreme cases, shut off the chiller.

The computer gathers signals from hundreds of sources and integrates them into a complete picture of the plant and water distribution operation each minute. Usually this is a picture of normal operation and does not require operator intervention. When an abnormal condition exists, the operator is automatically notified by printer or CRT terminal as the computer initiates the necessary action. Generally, the operator is unaware of computer control actions because, unlike the hot-bearing situation, most control is for normal operation. For example, in the Water Distribution System control of pump operation is accomplished by sensing the discharge pressure into the main. It compares the actual pressure with pressure parameters and in certain parts of the system adjusts the parameters according to the water level in an overhead storage tank perhaps miles away.

Many data-collection methods not used at the Center should be discussed to round out the subject. Optical scanning as it pertains to Optical Character Recognition is being considered, but so far it cannot be cost justified. If the cost of processing the tax and utility payment documents included keypunching, the use of OCR could perhaps be justified; however, the punched stub turnaround document is so effective and cheap that no other method can match it. Optical scanning equipment normally writes information on magnetic tape for later reading by the computer but can also be connected directly. Except for optical character recognition, which actually recognizes the stylized font of printed characters and some handwritten characters, the other optical-scanning methods require a particular discipline to read the information. Test-scoring machines are a good example of equipment which uses the presence or absence of marks in a fixed relationship to a sheet of paper to convert intelligence to machine language. Scanning equipment is also available that reads specific computer printed codes, perforations in paper, or the standard holes in a punched card.

There are four major uses of optical scanning starting with the printing of invoices or statements in the OCR font on a line printer as a turnaround document. This is presented at the time of payment, annotated with the cashiers comment, usually as marks, and scanned to record the payment. The second method is the use of marks or handwritten digits to record a great variety of information for reporting purposes. Meter reading and daily inspection activity reporting are two good examples. The third use is for procedures like gasoline sales slips which are processed from the OCR encoding of credit cards and the keyed sales amount using hand operated data recorders at the place of sale. The fourth method is the typing of collected data on a typewriter with an OCR font to be read a page at a time. This takes the place of the usual key driven data conversion and permits proofreading of the copy before scanning.

Being considered at the Center is the key-to-disk machine which uses a magnetic disk instead of a magnetic tape as a recording medium. This equipment is integrated into a data collection facility comprised of several input stations working under program control to feed information to a disk through a control unit. At specific times the information is spooled onto a tape for introduction into the computer. The keying stations usually have a cathode-ray-tube screen so the data can be viewed and corrected during the verifying operation. The cost per keying station decreases as the number of stations on a control unit increases, which makes this type of installation rather expensive if less than six stations are required. Also, for small operations this is an "all eggs in one basket approach" which can be disconcerting if the control unit malfunctions.

Cathode-ray-tube terminals are also used for direct communication with the computer. IBM offers Video/370, which allows the data to be keyed upon the screen, examined, and then written onto a magnetic disk which is part of the computer complex. Data recorded in this way can also be compared, and corrected, in a separate verifying operation. Significant editing of the data and the opportunity to make corrections if they fail the edits are part of the programming. The IBM 129 keypunch, for instance, can only specify which fields are alphabetic and which fields are numeric. This is also the limit of most individual key-to-tape devices. As the data gathering equipment becomes more sophisticated, the editing capabilities are greater, but even in the key-to-disk arrangements, there are specific limits defined by the control unit storage capacity. Video/370 is limited only by the power of the computer, the size of the partition in which the monitor resides and the imagination of the programmer.

Point-of-sale recorders, after many years in the doldrums, have gained a foothold in the retail trade. Replacing the conventional cash register, they provide cash-register facilities and capture sales data for the computer. They have the ability automatically to determine and record sales tax and other sales information as desired. The simplest operation, and the most time consuming, is key driven. Stock numbers and sales amount are recorded to prepare a sales slip. The data are transmitted to the computer where accounts receivable for charge sales and inventory deletions are recorded. Depending upon the complexity of the system, this information can trigger stock replenishment and determine the cost of goods sold in as much detail as desired. Department store procedures usually start with a free-standing device and progress to the computer connection and the use of hand-held reading wand, which scans a code on the item ticket to collect the data concerning the sale.

The latest development in point-of-sale devices is now being customer tested in supermarkets. The method starts with the uniform product code of items printed on the package in the form of black lines of varying thickness. This system must have a direct computer connection to an on-line file containing at least selling price and item description. Packages are passed over a transparent plate in the checkout counter; the code is read; inventory and cost of sales are updated; and the selling price is entered into the cash register. The sale slip shows the item description and price, the total, and the tax for taxable items. Equipment is available to imprint the code on meat packages and other items packaged at the store. Customer acceptance is slow, mostly because each item is not marked with a readable price. Test sites post the price of the item on the shelf, and some provide grease pencils so the customer can mark the price on the package. So far, customers show very little interest in doing this.

The collection of payroll data using time clocks connected to a computer is done for large groups of hourly employees. The two most acceptable ways are the punched time card and the plastic badge. Systems that only record start and stop work times normally use a punched card in a time card rack. The card is removed by the employee, inserted in the time-recording device, which prints the time on the card and transmits it and the employee number, which is read from the card to this data collecting equipment. The card is then placed back in the rack to provide visual evidence that the employee is at work. The same results can be achieved by using a machine readable badge or, not so desirable, keying in the employee number. Clock data can be transmitted directly to the computer or captured on an interim recording device for transmission at the end of the day. Since hours worked by employee is all the information collected, it is usable for Payroll and Personnel processing only.

The cost effectiveness of labor data collection is far greater when there is a need to know labor hours by production work order. This requires a greater number of collection devices on the shop floor but provides the capability of capturing production costs by unit or by work order. When a job is started, the starting time, the employee number, and the work-order number are entered by a combination of clock recording, keying, punched card or badge number. The system captures not only employee work time, and piecework if on a piecework-pay plan, but also the cost in man-hours of the work performed on each job order at each work station. It also provides the Production Control department with the status of each job order throughout the shop. When the job is recorded as passing final inspection, the data collected can trigger inventory updates or customer-shipping orders.

Magnetic Ink Character Recognition (MICR) equipment is the backbone of the banking industry. This equipment recognizes magnetic fields captured by the special ink used for printing the MICR font. Checks are preprinted for the depositor with bank, routing, and depositor-identifying codes. When a check is accepted by a bank, the amount is imprinted by a key-driven machine as part of the balancing routine of the bank clerk. The checks are fed into a MICR machine where the characters printed in the special ink are magnetized and then read and interpreted to make numerical sense. As the data is being sorted according to the coding, it is being entered directly into the computer system.

Corporations with regional offices and a centralized-computer facility depend upon electronic-data transfer to collect information for processing. Usually information is accumulated for batch transmission and may be keyed data that has been collected, processed, or a combination of both. The design of a communications network to achieve either goal is very complicated because it requires knowledge of the speed and type of equipment, the speed and the cost of the telep one line, and the geographic location of the district offices in relation to the Computer Center.

If a company desires to collect data of small volume from many points in a real-time environment, it may elect to use low speed typewriter terminals which will transmit data at a speed of up to fifteen characters a second. Collecting data on a nationwide basis to be transmitted to a central point suggests the use of regional data concentrators to collect and route information automatically to the computer center. The simplest device transmits each character as the key is depressed, which reduces the effective speed to approximately one character every two seconds. The terminals can be enhanced, however, to include a data buffer which will collect data as it is keyed and transmit several hundred characters at one time. This permits transmission at the rated speed of fifteen characters per second, resulting in the line being available to other terminals a greater percentage of the time.

To reduce the volume to be transmitted, small computers can do routine data processing in each of the company offices and transmit the results to the central computer installation in bursts. Nightly transmission is common since it usually costs less and it can be done on a dial-up network where either the computer or the operator dials the telephone number of the central computer and transmits the data when contact is established. The amount of data and the time frame in which it must be transmitted determines the speed of the line which, in turn, determines the cost of transmission facilities. The conversation can also be two-way with the central computer transmitting back the results of the processing as it occurs or in a burst at a later time.

This covers the types of data collection devices and techniques in use but there are many variations to be considered when reorganizing or establishing a data collection facility. Three vendors have been mentioned in this paper since these are the three supplying the Center but there are many others, equally qualified, from which to choose. The devices used by the Center are satisfactory for the job, but because a great many facts must go into a selection decision, citation of this equipment does not imply that these devices are the best or that they would be the best choice for another installation. A prudent selection of equipment can be made only after a careful study of needs has been matched to the essential characteristics of that equipment to guarantee both accuracy and economy.

Panel Discussion

Lawrence Pickens, Assistant Professor
Department of Data Processing Technology
Del Mar College
Corpus Christi, Texas

Pickens: I am going to direct my questions to Bob in the area of the criminal justice system. What type of security do you have to prevent outside users from accessing the network data system on criminal actions?

Hackett: As far as security is concerned we have to consider the cost of getting the information as opposed to the value of the information you get. Our terminals are local terminals connected by cable by use of conduits under the street. These are open and there is really nothing to prevent a person who wants information to drive up in a telephone company truck and put a barrier around one of our manholes and tap into the cable. However, he must know the address of the terminal that that cable is used for, which is pretty difficult to find out. This sort of thing would cost more money than we feel anyone would want to spend for the type of information we have.

Pickens: What about the availability of the information that is in the system? Is there a way that someone could find out what is in his file?

Hackett: Not from us, no. We regard these files in the same light as we regard tax or payroll files. The information is only available to the user that created the file. I can't speak for an individual going to the police department as to what he could or could not get from the police. They can get nothing from us.

Pickens: What type of on-the-call turnaround do highway patrolmen or city policemen get on inquiries from their patrol car units into the data base network?

Hackett: They call by their radio to the dispatcher and the dispatcher has a terminal. So the turnaround is the time it takes to place that call plus the few seconds it takes to get the response from the terminal and the dispatcher relates the information back to the patrolman.

DISCUSSION FROM FLOOR

Helen Ligon, Baylor University: Carol Meyer, from where do you get your data entry operators, and what kind of background do they have?

Meyer: At the present time, those people who work with incoming mail and are dealing primarily with customer biographical data are high school graduates with a good typing background. They are trained in the company details in house. The data entry operators where we are actually implementing the codes utility are currently Mohawk data entry operators, so they are already familiar with the data entry process; it is just a matter of retraining them for this new technique. People who are hired from the outside come in with a good typing background and simply have to learn to use the numeric pad.

Ligon: How are data entry errors detected?

Meyer: In the data entry system, they don't have to be that careful. You may have zeroed in on sight verification. Actually, as an operator becomes more proficient, she can feel when she has made an error. She can then look up at her screen to see where she is, back-up, correct it and then go ahead. If she doesn't detect an error on her own, when we do the preliminary editing, most of the time, we will catch it.

John Albino, Dallas County Community College District: I would like to address my comments and questions to Mr. Hackett in the area of security of files. It is precisely because I am involved in designing and implementing a data base that I realize that there is no security in data base files; none whatsoever, for the following reason. What one man can design and implement, another man is certainly smart enough to crack. Frankly, it disappoints me very much that we sit here and allow Mr. Hackett to give us the "camel's-nose-under-the-tent" answer to "Frankly, its not worth the money it would cost them to crack our system." That is a foolish answer, and any of us that let anyone get away with that should get out of the business right now.

Dreussi: I would like to comment on that. I think any system is as good as the people who use it. I believe that you can build a secure system, but I don't think there is a system that can't be cracked.

Albino: That's right. That is why I do not believe in national data banks. I know that if I sit down and fool around with it enough, I can crack a system. Any language you wish to program with eventually is translated to machine code. Therefore no locks exist. The classic case that most of us are familiar with is the chief programmer for the First City National Bank of New York using round off errors, who is probably living quite comfortably in South America or somewhere.

Dreussi: Yes, I think you are right. I think you can get anyone if you want to. I have an article here on the National Campus Information Center which will for $5 give you any information on yourself. I think this gives an idea to people of what kind of data is in the Center data base. As far as the integrity of the system, I don't know what kind of safeguards they have.

Albino: What irritates me more is that Hackett said the information he had was not worth the trouble it would take someone to tap into his coaxial cables. We don't know what kooks or fools with money to blow on some crazy scheme feel like doing in their spare time. If anyone has that attitude toward anything, then we all should get out of the business.

Meyer: John, I think Joe Dreussi directed that question to me last night and again today and I failed to pick it up because there were several points in one question. I must admit also that it is pretty hard to keep a system programmer from cracking any system. They pretty much can do what they want to do. He made also your same point that you never know what people who are a little bit off base can do to you. You are vulnerable, and we are a long way from solving all of those problems. In our case, to use our on-line systems that are being developed under data base management, before anyone can sign on and use the terminal, they must go through a security system that we wrote. It requires that they know their employee number, their unit code, and some kind of password. Now, we are using initials to validate employee number. But if security becomes a problem as far as on-line access to the data base system is concerned, we will tighten up on the password technique so that the password could be changed every day and the illegal person could not get on.

Hackett: I would like to make a comment on this. My time did not permit discussing all of the security measures. I want to point out that all the information on this data base, although correlated, is the same information that has reposed for hundreds of years in files that are readable by anyone with a sixth grade education. When we concern ourselves with data that is escaping, we must remember that the facility was there before computers more than it is now.

Robert Smith, Blue Cross/Blue Shield: This is an interesting discussion that I hope we can carry on for some time because I think here we are facing the problem that this sort of meeting should face. Yes, security we can have. Would you be willing to have your insurance go up $5 a month in order to be sure that we don't know that you had a hernia or an appendectomy?

Albino: Yes, I would as a matter of fact. I would be happy for it to go up $10 a month if I knew that something I did not want you to know, you would not know.

Smith: All right, let me ask you this. You have a home which has all of your possessions in it. What do you figure the locks cost?

Albino: Locks in my apartment cost about $25 each.

Smith: All right, do you have a burgular alarm system?

Albino: I do not have a burgular alarm system.

Smith: Why?

Albino: The reason I do not is that there is nothing of sufficient value in there that I would seriously lose. My things that I consider of that much value are kept in my office.

Smith: How is your office fixed up, then?

Albino: My office is fixed up with locks on the front door and a security guard in the lobby.

Smith: And you think that it would be more difficult to subvert that system than it would be to get into someone's data base.

Albino: No, it would be far easier. Yet, on the other hand, my personal information is more valuable to me than anything I could possibly have in my possessions.

Smith: All right, but you have invested no funds as I understand it to protect this office. It must have your income tax returns.

Albino: No, that is in my safe deposit box.

Smith: So how is the bank fixed up these days?

Albino: Well, that really doesn't bother me because that is not on a computer file. I was just wiped out of several computer files last week. What is to guarantee that that same wipe-out, when reconstructed, will not give a criminal record to a man who has never had so much as a parking ticket.

Smith: There is no guarantee.

Albino: That is right.

Dreussi: I think the problem so much isn't invasion of privacy where a company may have information we may not want them to have, but the ability of someone else going into the data file and changing entries to make them false. We have seen in the recent past that some people are ambitious enough in their goals in life that they try to change other people's past history. I think the main danger from these data bases is preventing people from gaining access in order to change them. Now we can say all we want about how secure our homes are, but probably depending upon what we have in our homes, 99 times out of 100 we are not going to have as many people looking at our homes as we are going to have looking at these data bases. Also, they will not be basing their decisions on credit, on whether or not we should be put in jail, etc. by looking in our homes; but rather, they will be looking in these data bases. If someone changed these data bases at some past time, it could completely ruin us for the rest of our lives. Talking about what is in our homes really isn't addressing the main problem, I don't believe.

Smith: Well, I think what we are getting down to is a question that deals with "who should do what to whom." We, here, representing industry today are bringing our problems. Apparently security is a problem. What is the academic community doing to solve that problem in a reasonable fashion--one that is cost effective enough to be useful?

Dreussi: I think the most important thing we can gather from this is that our data bases are not secure and let's not say that they are.

Smith: I gave up even trying to suggest that they were completely secure.

Dreussi: Let's realize that they are not and then go forward with what we can do to protect the data that goes into it.

Smith: Yes, but do we attack this problem with locks and keys, or do we try to put a little integrity and honesty into our academic environment. Are we working at which end of the problem? Sure the camel's nose is in the tent, but go around to the other side and see what is hanging out.

Phil Gensler, West Texas State: That is exactly the comment I came over here to make. That is the place I think the universities, junior colleges, or whoever is training the people to go into data processing, can step in. We must take the time and the effort to instill, in the people we teach, professionalism. Crooks are going to steal information period. What we need to guard against is our own people stealing information unwittingly or not. We can do this by instilling not only technical knowledge, but also a real sense of professionalism as we teach the students. That has to be our contribution.

Dreussi: Thank you, Phil. That was a good answer.

Stehling: We got a bit off the subject here from data collection to data security. I am sure that security has more than you could cover in two or three days. It is a very timely topic, and perhaps there should be a conference devoted wholly to data security. Are there other questions concerning data collection?

DATA PREPARATION AND PRESENTATION PANEL

Panel Chairman: Hollis Latimer
Chairman of Data Processing
Tarrant County Junior College, Northeast Campus
Hurst, Texas

DATA PREPARATION AND PRESENTATION

Rod Watkins
Director of Computer Services
Kimbell Foods, Inc.
Fort Worth, Texas

A vast quantity of time and effort is exerted daily to capture information. The sole purpose of this effort is to produce meaningful and timely control information. This process can be concisely referred to as data preparation and presentation. The volume of data increases daily in any growing institution. This volume increase has required new methodology to meet the requirement of timely data presentation. The rapid advancement of Electronic Data Processing in this decade has led to improved design of electronic computers capable of receiving, preparing and presenting data in a few seconds. The integrated circuit has proven to be a major breakthrough in electronic technology. It allows sophisticated equipment to be manufactured at prices which can now be cost justified in business and industry. This is a great electronic age which has risen from infancy to maturity in the last ten years.

Why, with the great technological advancement in electronics, do we struggle so in the preparation and presentation of usable data on a timely basis? Knowledge of new techniques in the minds of data processors for the practical application of business data processing has to be the key ingredient to successful advancement.

Traditionally, data has been collected and submitted for input into a computer which manipulated and organized it in some predetermined form for meaningful reports, usually representing both correct data and data in error. This necessitated the painstaking manual effort to correct errors and repeat the complete process until a file was termed correct, allowing final reports to be generated. The cycle from originator through a computer center back to the originator could take hours, even days. With increasing volumes of data, reports have become historical rather than timely.

The mean time needed for the computer process was the same for each successive update. The immediate solution for processing more data more quickly was a faster computer. The computer manufacturers have supplied the technology to increase internal computer processing speeds from milliseconds (1000ths of a second) in the mid 1960's, to microseconds (1 millionths of a second) in the late 1960's and early 1970's, to the current nanoseconds (1 billionths of a second). Industry has survived with this approach for a number of years, but again has reached a saturation point at which raw computer speed alone can no longer provide the needed relief. New procedures and systems must be developed to allow better utilization of people and the computer.

Electronic hardware with supporting system software is available today, allowing us to collect, manipulate, store and retrieve large volumes of data in fractions of a second. The problem confronting data processors is development of the most useful technique to prepare and present the collection of information in a useful manner. A typical person utilizing computer output reports to perform his job has several hundred pages of data in his possession. He must locate the data and often must extract information from more than one report to obtain the information he requires. In many cases, half of the productive time is used obtaining information rather than using it. These traditional reports are dictated by the computer process used to prepare the report.

Reports were usually designed by technical people for program convenience rather than user convenience. The users typically did not fully understand the capabilities of the system. They were becoming slaves of the system rather than using it as a tool to achieve meaningful results.

A common complaint was that if a problem developed in which the original input data was needed for validation, the computer report was in a different sequence which created a very difficult task in locating the appropriate documents.

With these problems identified, user oriented systems are being created. As we at Kimbell Foods, Inc. started development, we established training seminars and round table reviews to ponder reporting ideas trying to insure usable reports. It was brought out in these discussions that most formal data processing education is directed toward the technical mechanics of computers and programming rather than obtaining meaningful user oriented results from the system. We now perform extensive analysis to fully understand a report's intended function before it is designed.

Paper costs have become a significant item on data processing budgets this past year. Average paper cost in the retail/wholesale industry is sixteen percent of the data processing budget. With the rising paper cost and serious questions being raised about future paper availability, Kimbell Foods, Inc. has been researching methods of reducing cost and improving dissemination of information.

Our company is in the process of centralizing data processing. We will be installing a second medium sized computer in our general office data center and removing six remote computers. Distribution of information will take place through video terminals and intelligent remote printing terminals. All of our wholesale inventory control and distribution will be handled in this manner. Application systems interact with each other. Distribution systems automatically update accounting files making management information available within hours. Inquiries for information can be made on a video display, and most answers are available in two to four seconds.

When immediate access to changing information is needed, video displays provide direct interactive capabilities with the computer system. Kimbell is currently using sixty such terminals for check authorization in our retail stores. The stores demand that an individual's check history be displayed on their video display within four seconds after the request. This has proven to be a very successful method of instantly updating check history and authorizing check cashing. Perishable grocery orders are entered and validated through video displays directly to an inventory control and distribution system.

There will always be some on-line report printing by the computer. Pilot tests are in progress measuring the effectiveness of two different methods of reporting information minimizing hard copy reporting.

Microfiche is being used to replace reference reports in which eight to twelve hours delay is acceptable after processing. Microfiche is a three-by-five-inch filmstrip capable of storing two hundred three standard computer form pages and an index page on each fiche for rapid accessing on a viewer. It offers the advantages of fast reference to information and takes very little storage space.

Xerography is a process in which reports are produced from magnetic computer tape. This process produces reports on standard letter-sized paper. Multiple reports can be collated and overlays allow formats and headings to be superimposed on the report leaving the data as the only responsibility of the computer system. Xerography offers less bulky reports and consistency in quality for any number of copies. This system usually displaces one on-line printer, making it very cost effective if one hundred thousand or more pages a month are printed.

These are only two of many techniques which offer improved data presentation. People must continue to research better ideas and improvements in equipment to better disseminate information.

What qualities do we look for in young graduates as incoming members of our data processing departments? We seek individuals who are progressive thinkers with logical minds. Those people should not be willing to accept a methodology simply because that's the way it's been done. The individual should have a solid foundation in progressive data processing and an understanding knowledge of all areas of business. Positive thinking with dedication and patience to provide meaningful results for others can offer a challenging career.

We encounter students daily with computer science, business and accounting degrees who have a solid foundation in the use of computers. Each of these people is eager to make his presence known in the data processing profession. There is always a need for new enthusiasm and ideas. We also encounter people at work and on the street who immediately activate their negative defenses if the word "computer" is mentioned.

In our world of massive information in which the computer is the only tool which can prepare meaningful information before it becomes ancient history, our young people must be taught to utilize this powerful tool, not fear it. The key to success for future advancements in data processing is the continuing education of all our young men and women toward new ideas and technology.

Panel Discussion

Phil Gensler, Head
Department of Computer Information Services
West Texas State University
Canyon, Texas

Gensler: I agree with everything Rod says. However, I do have a couple of things I would like to respond to. We have talked this morning about all the different methods of data collection and all the ways to get data into the machine. However, I suspect that if we educators are honest with ourselves, we don't really consider that to be our job. That is the job of skilled labor. Our job is to create computer scientists, people who design new algorithms which store, retrieve and process information, and handle that data faster and more efficiently and keep it up to date. I really do think that is what our job is. In order to do that job in education, I sense this morning from listening to speakers, particularly Rod, that as educators we are going to have to make ourselves more aware of the problems associated with data entry. As we teach our programming courses, we should try not to neglect the problems of data entry. This is easy to do because in programming classes we usually take one of two approaches:

1. The student prepares the data himself, in which case he is very motivated to be careful.
2. The professor prepares the data and he either gives very clean data or very sloppy data, depending upon what the lab problem is trying to accomplish.

I think industry can help us in the data processing education field by making us aware of some of those problems. In education we talk about internship programs quite a bit. Every time you start to hire one of our graduates, one of the first questions you ask is what experience he has. Well, he doesn't have any. We get mostly people who are 18 years old, and when they graduate, they are 22 years old. They have not had the opportunity to get experience. So we have concerned ourselves with various kinds of internship programs to give them some type of practical experience. Some of those internship programs have been very successful thanks to the cooperation of people in industry. However, another type of internship program that might turn out to be more profitable in the long run would be an internship program for professors. You spend millions and millions and millions of dollars on computer equipment. Why don't you consider spending $5,000 a year to bring a professor in for a semester or a summer and acquaint him with your organization and what you do and the problems you run into. He would learn a great deal, and I venture to say, you would gain something from it also. The long range gain would be in the experience that he would take back to the classroom, as well as a more overall picture of what the data processing field is today. So that is one suggestion I would make.

The other one I want to make in response to Rod's statement is that you do a great job training people technically, but how about all those other folks that graduate with degrees in Accounting, History and English and join the labor force and hold down jobs, yet do not know anything about computers. Why don't you teach them computing, too? Man, I would love to. But I can't get them in my classrooms. Why not? Well, because everytime I propose that at least one computer course . . . , lord, you want 6 hours, but I would be happy with 3 hours to start with. At least one computer course ought to be required for any person to graduate from college today if we want to have some semblance of them being educated to go out into the world he is going to face. But that means we may have to remove an English course from the curriculum. And that means we are going to put four people out of work in the English Department and hire four people in the CIS Department. Those four people in the English Department are not going to be able to transfer to the CIS Department and start teaching there. How about money? If you take those other thousands of students who are non-CIS people, put them on our computer system, and provide them with the terminal capabilities that it takes to interact with the computer system just a little bit, I will have to ask for an increase of about half a million dollars. I don't think the legislature is going to be very impressed if I say "Look, if you guys will fire four English Professors, and hire four CIS Professors, and give us an extra half a million dollars, we will train all those people so that they know about computers when they go to work. The reason that they would not be impressed is because I am in the CIS Department. I am prejudiced. I am biased. They are right. I am. But where you can help us is that you have a lot of influence with a lot of people; and you are not biased like I am. They will respect your opinion as a real world opinion. You can make an impact on college presidents. You can make an impact on Boards of Regeants and legislators. You can make an impact on the people who make it possible for us to teach everyone something about the computer.

So those two ideas are the two primary concepts that I want to leave with you in response to Rod's comments.

Latimer: I agree very much with your comments. Often in education we have to sit more-or-less on our hands because there are so many things we would like to do, but we are not heard in our own community like you would be heard from the outside, especially when you call the chancellor or someone like this. We hear from that quickly.

DATA PREPARATION AT
TEXAS ELECTRIC SERVICE COMPANY

Richard Wipf
Data Systems Supervisor
Engineering and Accounting Systems
Texas Electric Service Company
Fort Worth, Texas

Exception Reporting, Xerography, Soft Display, and Traditional Hard-copy Reports may have varied definitions in a group of people with such varied backgrounds as this group of Educators, Students, Business, and Industry. For this reason, I would like to start by giving a brief definition of each topic, not necessarily a Webster definition, but a definition as the topic pertains to my company, Texas Electric Service Company (TESCo).

1. Exception Reporting - each input record will be subjected to a rigid validity test and will be applied to the master file only after all validity requirements have been met. The audit procedure includes the usual numeric data checks for numeric fields and a reasonableness test to see if specific fields fall within predetermined limits. Also included are cross checks, such as, if field 'A' is present, 'Q' and 'R' must also be present and valid. If the input records are update records to an existing master, the cross checks are carried to the master as well as the transaction. For example, if 'A' is present in the transaction and data is not present in 'S' and 'T', the master must have 'S' and 'T'.

2. Xerography - is the process of transmitting data from one location to another over telephone lines. A document is placed in a copier at the sending location. The telephone connection is established. The copier is activated, and a duplicate of the sending stations document is received at the receiving station.

3. Soft Display - is the display of information on a CRT device. The device operator can "talk" to the computer in a conversational mode to learn facts, solve problems, or to update a data file.

4. Traditional Hard-copy Reports - is the presentation of data from the computer's data files in the form of paper reports.

As a background, Texas Electric Service Company, with general offices in Fort Worth, serves 400,000 customers in 113 cities, towns and communities located from Grand Prairie on the east to Wichita Falls on the north, and along Interstate 20 to the Midland-Odessa area on the west.

First, let me explore Xerography. We used a terminal to transmit a customer history card from our records center in Fort Worth to the Arlington Customer Service center. The terminal served its purpose fairly well, but was discontinued after about two years of operation due to an internal reorganization which eliminated the necessity of data being available at the Arlington office. The terminal was used for a low volume of data. The transmission rate was slow, two to three minutes for a 4 inch by 8 inch history card. The slow transmission rate was satisfactory because of the low number of requests for data to be transmitted.

There are two major systems at TESCo that use Exception Reporting. The Customer Information System (CIS) and the Transformer Management System (MONITOR) both use exception reporting to a degree. CIS, which is run daily, consists of thirty-five programs having a total of four hundred user messages. Twenty thousand transactions are processed against 450,000 master records. The MONITOR System, which is run weekly, processes 5,000 transactions against 200,000 master records. MONITOR has twenty-five programs with three hundred user messages.

CIS is basically the Customer Billing and Receiving system for TESCo. Each customer is billed once a month, and the customer makes a payment once a month. The daily CIS run cycles all of the master records and prepares a bill for approximately 1/20 of the file or 20,000 bills. The major output of the system are the bills, daily transaction register, user messages, meter reading cards, and a list of the masters that are being billed on the individual run. The bills are printed on a high speed printer using a special Optical Character Recognition (OCR) chain. When the customer makes a payment, the returned stub is fed through an Optical Scanner which prepares the input transactions to the next CIS run. In this manner, the output of a previous run becomes the input to another run. The meter reading cards are prepared by the computer and are also printed by the high speed printer using the special OCR chain. The meter reader marks the meter read cards which are then fed through the Optical Scanner which initiates a transaction to bill the customer. A minimum of human intervention is required through the entire Meter Read, Billing and Payment cycles. It should be apparent by the volume of masters/daily transactions that it would be impossible to print the entire 450,000 masters daily. The key to an efficient information system these days is the ability of the computer to assemble and distribute timely information to those who need it. This task can be accomplished more easily and efficiently by using microfiche output. Recording computer data directly on microfiche at high speed can optimize the use of the computer. Each 4 inch by 6 inch fiche can contain the equivalent of 207 pages of data. The CIS register, a list of the daily activity, is prepared daily on microfiche. The customer names that are being billed during each cycle are also printed on microfiche with all of their previous months' updates reflected on the new fiche.

The microfiche operation has greatly reduced the computer time required to print traditional hard copy as well as significant savings in postage, and the paper crunch has not been a particular problem at TESCo.

The MONITOR System is a transformer management system responsible for keeping track of the 110,000 transformers that are either serving active customers or are in reserve waiting to be installed. The old transformer system which generated enormous quantities of paper output was replaced in 1970 by MONITOR. Transformers are very mobile and are frequently moved from location to location. Locating a "misplaced" transformer was at best a "hunt and peck" effort. The transformers had to be listed in ten different sequences to help the user locate and maintain his master files. The time required to print the weekly reports grew to seven hours. Now, with MONITOR, exception reporting, and microfiche reports, the data is assumed correct if no exception messages have been printed. Four lists are furnished to the user who corrects errors. The weekly transactions and the exceptions are listed on traditional hard copy. There are two lists of the transformers in different sequences which are produced on microfiche. MONITOR is much tighter than the old system, making it virtually impossible to "misplace" a transformer.

To reduce the number of programs in the CIS and MONITOR Systems, as each program capable of producing user messages is run, the messages are stored on exception files together for proper sorting and printing. This procedure allows all of the Fort Worth exception messages to be printed together and all the Wichita Falls exception messages to be printed together, etc.

Soft Display is an exciting threshold that TESCo is about to cross. In May we plan to start operating Phase I of a Trouble Dispatching System (CATS). When a customer calls in with a problem such as lights out, an operator will enter the customer's address via a CRT console. The customer's data will be displayed for the operator to verify that they have the right customer. The operator will then enter the type of trouble and the customer's telephone number for possible call back after the service has been restored. The operator will then release the transaction to the computer where it will be processed, and a trouble ticket will be printed at a remote service facility.

Phase II of CATS is scheduled for operation in September. As a storm passes through the area, calls will be taken just as in Phase I. The operator will release the transaction to the System, and the transaction will be stored on an on-line data file. From time to time, the Service Center that is responsible for returning customers to service will "ask" the computer for a display of customer outages. The various outage information will be displayed at the service center. The service center operator will be able to make an educated guess as to the cause of a problem. He will then radio dispatch a trouble crew to repair the damage. In this manner, the probably cause of trouble has been determined, corrective action has been initiated, and not a single piece of paper has been printed. This may not seem significant until you consider that last year TESCo had 15 storms lasting less than 15 hours and 30 storms lasting over 15 hours. During storm periods, it is not unusual to receive 800 to 1000 calls per hour.

We know that with our entry to on-line computer inquiry, we have just scratched the surface. We have already had inquiries about possible future systems of on-line applications such as purchasing, inventory control, customer service inquiry and management reports at all levels.

For TESCo it is apparent that Exception Reporting, Soft Display and Microfiche are here today and will be here in the future. On the other hand, traditional hard-copy reports are a thing of the past.

Panel Discussion

Iva Helen Lee
Director, Data Processing
McLennan Community College
Waco, Texas

Lee: It has been very interesting today to hear the presentations on data collection, preparation and presentation given by these representatives from industry. Having worked nine years in the computer field for the Atomic Energy Commission and an Austin based research firm and having taught and done administrative work for six years in higher education makes this type of conference of particular interest to me. In reflecting on my past experience and the talks here this morning, three points come to mind. First, and most important is the cooperation necessary between industry and the colleges, particularly the state supported colleges. The public community colleges or junior colleges were the first to see that their local communities needed more than just the traditional academic work. Therefore, they have added two more areas to their curriculum--the technical-vocational area and the community services area. The senior colleges have been slow to adopt these last two areas, but they too have been changing rapidly in the last few years. In most communities, the community college data processing or computer science department tries to work closely with industry so as to produce DP students with the skills necessary in that area. Instructors in the state college DP area must have a minimum of two years DP experience in industry. We hear employers say, "We believe in training our own people from scratch." How foolish! Industry is paying personnel to learn, when instead, if they were working closely with the colleges, industry could get employees who have already paid for some of their own training. In addition, the employees hired would have already gone through a certain amount of screening. Thus, cooperation benefits both industry and the college. This cooperation can often occur through advisory councils or even through the local DPMA or ACM groups. In Waco, the Heart of Texas DPMA sponsors our MCC student DPMA club by paying half of the students' national dues. Members work actively with our club. Many of our technical areas, such as accounting and management, do require introductory DP courses. Office occupation students are encouraged to take our keypunching course. We do teach skills.

Secondly, despite state funding, most technical education equipment, particularly in the computer science and health areas, is very expensive, and state funds are limited. How is a small community, junior, or senior college to obtain all this modern equipment, such as the data preparation equipment discussed here today? Many industries provide several thousand dollars per year for various scholarships in all areas, even going so far as to buy special artificial turf for the football stadiums. Has your industry ever considered putting out money once, now, mind you, I am just saying only once, not every year, for key-to-tape or key-to-diskette equipment for your local community college? I know of only one case, that being here at East Texas State, where Blue Cross/Blue Shield assisted East Texas State in obtaining the use of two CRT terminals.

Thirdly, both industry and education need to see that their personnel have more management and personnel training. MCC now requires that their DP graduates take at least one personnel management or small business management course. When I think back on my days in industry and college work, I cringe to think of the money wasted because the persons in management positions had not the slightest knowledge of what it takes to manage people and equipment. This is particularly true in smaller industries and colleges. For example, your manager should know that:

1. IBM is great, but it is not the only company producing good DP equipment.
2. You can purchase or lease older IBM equipment much cheaper through reliable third party leasing companies, have it maintained by IBM, and never know the difference.
3. Non-IBM peripheral equipment can be used on IBM computers.
4. That fancy equipment is wasted unless you have an adequate and well-trained staff.
5. Salesmen often want to sell you what's best for their organization.
6. It is not necessary to reinvent the wheel. Just visit around and talk with the DP people, most are glad to share.
7. Management is an art of getting people to work together. All employees like to be praised for work well done, not just fussed at for goof ups.
8. Managers should have training in interviewing potential employees.
9. The DP manager, particularly the college ones, had better keep his/her own set of books, because heaven only knows what weird charges you might get from the media center, the bookstore, IBM and even your business office.
10. The Presidents, Deans, Managers and other higher ups would do well to get out from behind that desk, and those holy areas so well protected by their secretaries, and talk and listen to what their employees, students, and even the custodians are saying. It might prevent a lot of crises and blow-ups.
11. Look into your industry's or college's recruitment, selection, and promotion practices. Do you really know what your personnel manager or DP manager or operations manager is really saying or doing?

Could it be possible that a member of your company is talking to a woman DP manager and saying that he needs a computer operator, but no women please. That is like telling a black "Don't send me a black." But, she will probably reply that she will send you her best students and let you do your own screening. Why do you suppose your representative would have these objections to hiring women computer operators? I am concentrating on women computer operators, because in our area, about the only way you can get to be a programmer is to be a computer operator. A woman may turn out to be the best computer operator ever, with a husband who would be more than happy to pick her up after work at night if your company is in a bad part of town. Beware of adopting an overprotective attitude toward women employees. Often men feel that women are not physically capable of carrying heavy boxes of paper and cards. Many women are just as capable of handling heavy items as men. Other complaints against women are that they are not permanent, they are too emotional, and they cry all the time. Have you read the nationwide statistics put out by the Women's Bureau of the United State Department of Labor? These reports show no significant difference in turnover and sick leave in relation to sex. Could there be something wrong with your management and hiring policies? Many managers do not have the previously mentioned problems with their women employees.

In conclusion I plead that, first, both education and industry try to work together as closely as possible for the benefit of both. Second, that consideration be given to equipment and aid, where needed and feasible. Third, that both areas stress better management training, be it through college or in service training.

DISCUSSION FROM FLOOR

Unknown: Too many colleges and universities seem to think that computer science majors are the only ones who are taking or need to take computer courses. Thus, they tailor the curriculum with that in mind. When we bring non-DP majors in to a DP course, we try to computerize them. To be educated and functional in today's society, students in other disciplines need to take computer science courses which are taught with non-DP students in mind. They need courses that will orientate them to computers and not make computer scientists or programmers out of them. We need to give them information that they can use when they set out in a manager's position so that they can talk with people about what they want the computer to do and what kind of data to put into it. These are the kinds of courses colleges need to create for non-DP majors. But before the course can be offered, there must be a demand. We need to get the industry to convince the educators that that type of course has to be available in the schools. Then the course can be created.

(Question indistinguishable.)

Lee: I am told that this problem is not as bad in the cities. However, from what I have heard from some of the experienced women programmers with whom I have worked, when you start looking for a job, there are some companies with whom you just don't bother interviewing. I think that this is true, but sometimes you don't know what the people in the lower echelons are doing.

John Nickerson, Blue Cross/Blue Shield of Texas: I am a recruiter for Blue Cross/Blue Shield. Right now we have 50 openings at Blue Cross for qualified data processing personnel, and we will be happy to hire women.

Lee: I tried to get some of our people to come to Dallas, but these Waco people do not want to leave Waco. They are afraid of the big city. However, we do get a few of them to your area.

Gensler: John, what kind of people are you looking for? Are we not training the right kind of people? We have graduates.

Nickerson: We hire graduates, primarily from East Texas, but we have hired some from North Texas. We are looking for people who are trained in data processing, but who are well rounded and know how to communicate and work with the users.

(Question inaudible.)

Watkins: It is necessary for us to have some interface with the user. Once, after talking with a programmer analyst who had been sent to answer questions about a certain report, an executive of our company remarked to me that, "When I want to know the time of day, I do not care about the inner workings of a Swiss watch." He made his point very strongly in that area. At that time, we implemented a group of systems analysts who understand the concepts of data processing but cannot code a program. This has worked very successfully for us.

Cliff Hemming, East Texas State University: It appears that what industry says they want are people who are well trained in other areas and know something about computers, enough to communicate with them. However, when I look at the ads in the paper, and when I talk with people who have talked with recruiters, I get a different picture. Recruiters ask "Do your students know TSO?" I say "No, we do not have a 3 megabyte 158; we cannot afford to run TSO. But we have people who know a lot about the insides of computer programs." It appears to me from pragmatics, we are being asked to turn out people experienced in the very latest area of computer techniques, yet at the same time industry says they want people who have a wide background and are able to communicate well; whether they code too well is not important. I hear two different sides; I am confused.

Watkins: Cliff, I feel that Computer Science Departments in our universities are doing a fine job training technicians. The element we are after today is that we don't feel your professors are teaching anything to do with data processing in the other degree plans. An accounting instructor, for instance, teaches basic traditional accounting, and does not relate it to an automated accounting process. I think we need this. If some of the instructors related to data processing in their courses, it might encourage the students to know more about computerized data processing, which would prompt them to take some of the courses offered in the Computer Science Department.

Smith: Let me try to bridge the gap here. I think we have a semantics problem. When we in industry talk about hiring people with technical skills, true, we would like to have those technical skills, not necessarily because they will be used that day, but because they have been gained. Now, if you were going to hire a mathematician, you would want one who had done some algebra and perhaps differential equations. You may be going to use him in industry as a statistical analyst or something. When we talk about analysts who do not program, I have a problem with that sort of creature. That is like a mathematician who cannot do arithmetic. Sure, programming is necessary. I would love to program myself, but I can't afford to. It doesn't pay well enough. But that does not mean that I could do my job without having been a programmer. I think we have to realize that what we are looking for is an individual who has grown up and who has been through the various phases. I am perfectly willing to bring a youngster in who can program, then make an analyst out of him; but I do not want to try to take an analyst and make a programmer out of him. He has missed something. Let's give students the basic skills. Give them the ability to program, but don't run it in the ground. What we need is a person who has the basic skills. We want a person we can use for several years. You have students four years; we have employees forty. Can a person come in as a programmer, move on up the ranks, communicate? Are we hiring someone who can stay with us or are we hiring someone who is looking for the next ten cents an hour he can find? Give us the well-rounded individual; we will train him in our own way of doing things.

—Ninety percent of our people's time is spent trying to communicate with the user. If he cannot communicate, what good is he? We are not there to run a computer. We are there to pay claims, provide customer service, and fulfill our motto of "people helping people." The programmer may not stay in data processing over five years. Have you ever seen an old programmer? He moves into management. We think of the data processor trained in our area as the best material we have for the president of the company.

Donna Hutcheson, East Texas State University: I hear many of the industrial representatives stating that they want accounting students who know something about computers or even English majors who know something about computers. Which one of you are going to come to the university campuses to talk to the Dean's Council, or the President, or the people who make decisions about what is taught in the other departments. The Computer Science Department can only make decisions about what is taught to computer science majors. When are you in industry going to help us convince the other departments that their students need to know about computers?

Wipf: Our personnel department does not have the responsibility of hiring for the DP department. We come with them when they come to campuses, so we do the hiring.

Lee: Do you hire two-year graduates?

Wipf: Yes. We even hire high school graduates. We have the same problem John Nickerson of Blue Cross/Blue Shield has. We want well-rounded people. The programmer of fifteen years ago who was a career programmer is a thing of the past. The people coming through the DP department door today are planning to be programmers for six months, then move on to management. That is the type we want to interview and hire.

Watkins: I would like to respond to one of Donna's comments. Richard and I came today, not so much to talk to DP educators, but to get on our bandwagon and find out where to talk to other departments. We in industry have started to speak out. I have made this same comment at TCU on numerous occasions. New ideas seem to have to go through a cycle in education. We will make the statement for a period of time, then about a year later it will come back as a suggestion from the other departments, and then it will be implemented. I am not sure that we in industry have the power to push it through, but we are going to stay on the bandwagon.

Charles Oualline, East Texas State University: I came from the engineering profession, and in that profession, we were taught fundamentals and then had what we hoped was a well-rounded kit of tools. When we went into industry, no one expected us to be productive for a year. We were trained at that point in time to be productive to industry. The thing that I see different in data processing is that our graduates are expected to be both well-rounded and also immediately productive. I don't know that they can be both.

Wipf: We expect to hire people and then have them sit in their chairs for a year before they even crank out a line of code that is in a productive manner. We don't expect people to be productive tomorrow, and we are willing to spend the money to get them.

Smith: That is true. Sometimes, you get into the question of what is productive. Perhaps the youngsters feel that they are productive when they really are not. We give him a job; we keep him busy. Sometimes we win, and sometimes we lose. Sometimes they get disconcerted.

Latimer: I would like to make a comment similar to what Iva Helen said. We just placed a young lady in a programming position this week. If we had two dozen people who were as well-qualified, we could place them right now. I would like for those of you who talk about a well-rounded program with a technical edge to take a look at the degrees from East Texas, West Texas, Stephen F. Austin, and our junior colleges, and all other colleges I may have failed to name, who are progressive and are in touch with industry, and you will find an emphasis on logic, English, accounting, and communication. In other words, if you will look into our programs and visit our campuses, you will find a well-rounded curriculum.

Meyer: I want to address several of the comments that have been made. With regard to Rod Watkin's comment about non-DP majors, I very definitely agree with that. In fact, I would like to see particularly your business school majors have at least 6 hours of computer science courses. I have a personal crusade in San Antonio where one of our largest universities' business school will not accept a computer science minor. One of the ways we try to influence what the universities do is that we have some of our company officers on the Board of Directors.

If we hire a college graduate who is a non-DP major, after two or three years, other divisions in the company try to recruit him onto their staff. We are allowing this to take place because it is enhancing the communication line between the user division and the computer services division. That is an interesting career path trend that is taking place in our company. I think it could be headed off to some extent if the business majors had some DP background, because the biggest problem seems to be in communication and in evaluating what a computer can do for them.

The other attack we have taken is the structuring of a computer concepts managerial course for all levels of management. At the top we recruited IBM's help in training our higher level management people. But coming down now toward what we call the middle management people, we are going to train them in-house. This is done just to put them in a better position to work with us as far as the communication of computer concepts is concerned.

Someone asked why the industry would ask for technicians on one hand and well-rounded programmers on the other. I think the basic reason for that is that we have the need for both. In my particular shop, we are after technical skills, so we will look for things like TSO and PL/I or data base management. In the application areas, they do not care about the technical side. They are looking for well-rounded people who will make good analyst/programmers or system analysts, and who can communicate with the user when necessary. I think I heard someone say that they would not think of having a systems analyst who couldn't program. Well, if you have that hang-up, and I know many of you do, here stands a person who has been in data processing for twelve years, and I have never earned one hour's pay for programming. I came up the systems analyst side of the house and moved into the technical side of design. You seldom find a systems analyst who is also a good programmer. They are usually two different types of people.

As far as training is concerned, I have to disagree with what has been said so far. If we are hiring trainees, we usually look for computer science majors or minors. We will bring them into the company and train them no longer than four months in a classroom environment before we put them on the job. The reason for that is that the last time we tried to train them for six months, the critiques that came back indicated that the students felt very uninvolved and very isolated. They wanted to get in touch with the computer work faster. So now we train them for three or four months, then put them into an OJT program. Later they are given more advanced training as it seems to be needed.

Henry Jackson, Honeywell: I want to mention something that has not been mentioned today. That is career education. I am talking mainly from some of my exposures in the past. My exposure has been with the Dallas Independent School District and with their efforts at trying to place students in the shops of industry. I am mentioning this because we are talking about college graduates and people who will be viable in our shops, those who can produce, those who have this logical mind. As a college graduate, this individual has developed himself for the most part. He starts this development at a much earlier age. From the stand points of both college and industry, I think we should address ourselves also to those students in high school, because they have the programs of vocational education, distributive education, or industrial co-op training. In these cases, the involved students will go to school for a half day, and work in some industry position for a half day, and they assimilate the skills and trades of the particular type work they are doing. I am saying that if we co-operate with the public school systems, we can get into our college classrooms a person who has already developed to a degree the skills and expertise needed to function as a professional. This also is a foundation for producing an individual who might attend college for one semester and work in industry for another semester. I talked with a young lady prior to this session who tells me that she is about to receive her Master's degree in computer science. This young lady, in shops that I have been in, will not be able to produce or to earn the salary of a normal Master's degree person because she has no experience. She may come into a shop as a Master, but she may work for a person who has no degree at all, but has practical experience. Is it possible that we could start to advocate picking up both practical and academic exposure at the same time?

Lee: Some of the community colleges are working with the high schools through an early admissions policy. When the high school students are juniors, they can apply to come out to the community college and take up to 12 hours while they are still going to high school. Then they can enroll at MCC and get credit for the courses taken while in high school. Also, we train five interns a semester in our administrative data center.

Gensler: We are looking into the possibility of developing a co-op education program like the Engineering Schools have had for a number of years. This would do exactly what Mr. Jackson suggested. I do not know how successful it will be or how much co-operation we will get, but we are at least checking into it.

(Comment inaudible.)

DATA BASE MANAGEMENT PANEL

Panel Chairman: Eugene Smith
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Business Analysis and Research
Texas A & M University
College Station, Texas

Introduction

Smith: The topic for this session is data base management and I think it is one that should be very important to all of us. It seems to me that in the computer profession we are striving for maturity. We are faced with a money crunch. We haven't always been truthful and when we try to get more money, we may taint our budgets. But we are finding that this is getting more difficult. Maybe one of the areas that will help us to become more productive is data base management. It seems that we are experienced in the evolution of techniques and certainly we are experienced in continued sophistication in the areas of hardware, software, and perhaps most importantly, user applications. For a long time we had great ideas of what the computer could do for the companies. Then people began talking about such things as a total information system. I think those of us that were in industry were worried about this concept. As software and hardware became more sophisticated, we began to see integrated data bases and mass storage systems as more feasible. We need a good way to manage all the data we collect. The DP manager is faced with ever-increasing problems, and certainly in the area of data base management he has the problem of whether to make or buy. I think we are very fortunate this afternoon to get news of two somewhat different shops, one very large shop and one small-to-medium shop. I think we will get a good idea of both ends of the continuum of data base management.

INDUSTRIAL USERS NEED IN DATA BASE MANAGEMENT

R. E. Griffith, Manager
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Shell Oil Company
Houston, Texas

OUTLINE

Source Entry Data Validation

- Batch
- TP

Minimize Data Entry on Transactions which Require Repetitive Use of "Master" Data

Effective "Immediate" Inquiry and Display - TP

- Structured
- Query language

"Associate" Data at "Decision" Time

Data Dictionary

- Readily understood by user
- Content of DB
- Display and access

Flexibility and Efficiency of Access - Batch Retrieval

- Multiple access methods
- User oriented language
- Processing efficiency (resources required)

Multiple Device Support

- Device speeds (bandwidth)
- Device types (keyboard, CRT, printer)

Flexible "File" Definition

- Add/delete data elements (central control required - only discussing ease for user)

Data Control Mechanisms - Integrity of DB

Security

Recovery/Restart

(The following presentation was transcribed from tape.)

I want to talk about the use of what we call data base management systems in the context of a specific industrial application. We have had various computer based accounting systems. We have tried total information systems. Of course, I think we found out that when we have, we were foolish. We have taken one step forward from the accounting system and one step back from the total information system, and we have tried to build an operating information system.

In the chemical company which this past year was about a 1.25 billion dollar per year, high value added, manufacturing distribution and sales enterprise, we have a thing that is called an order, and it usually amounts to a conversation between the representative of a customer and a group of professional people who know our customers and our products, called customer service assistants. The customer service assistant in the old days scrolled a great deal of information as to what the customer wanted, when he wanted it, where he wanted it, how he wanted it delivered, and specific shipping instructions to the shipping location, in other words, very detailed massive information that only the CSA honestly knows about that customer. They scrolled this information. They gave it to an integrated data processing operator who sat at a keyboard with a teletype machine that would handle paper tape in /paper tape out and accomodate the same kind of keystrokes as a keypunch machine. These operators prepared paper tapes which were given to another operator, called the network operator, who fed the paper tapes with the proper header information into a very complicated network which we operate for ourselves. The information then went to a computer in Houston which stored the message and sent that message with a complete copy of the order to the warehouse or shipping plant. The warehouse had to extract from that order the essential information that went on the bill of lading. From the bill of lading the warehouseman or the plant dispatching group made a packing slip or a shipping order which they gave to the people who loaded the truck. They then confirmed a large portion of that order back to the same computer from which they got the order in the first place. This went on and on and on.

So you have a sequence for an order: bill of lading, a shipping order, a packing slip, and order acknowledgement to the customer, and an order copy to the district manager. Subsequently, a transaction is created, if we do ship the goods, which debits the inventory for the goods that moved out of our custody to the customer. It creates a freight bill, which must be returned to us by the vendor, which we must leave in the iron for so many days to satisfy the ICC. We may have to get a confirming weight ticket back from the railroad.

Subsequent to all of the above is another sequence of paper and transactions to be created. An invoice tells the customer how much the goods were worth. All kinds of pieces of paper dealing with the many business arrangements that go with our contracts must be completed. We then create a transaction that is called receivable line item which finally gets into the old-style accounting system. We update the customer's ledger. Later he sends us a pay document, which we then credit back against his account.

I am trying to illustrate that operationally there are a lot of transactions created, most of which reflect in the level of manufacturing, the working capital charges for inventory carrying, and certainly the government. So we tried a data processing system that essentially gave us one time entry of all confirming data necessary to track the entire operational status of the system. We did not start with a data processing concept. We started with a management committee of six user managers. We had an idea of what we wished to achieve operationally in managing the company, and that was one time data capture by the people that best know that area of the business and to carry through on all validated data possibly to the next sequence of operations within the company. From that we generated a data processing concept. It is not unique to us. IBM was offering some of the concepts to its customers. Other competitors were discussing with us the technological feasibility of implementing these concepts. I do not particularly believe that a group of people from Shell got together one day and turned on a bright light. We were pretty clever, though, in assimilating a lot of good ideas.

(Presentation and discussion of transparency of Shell system configuration.)

Our concept was to construct data bases which would satisfy all user functions. The major data entry is interactive and is validated as it is entered. The data bases are hopefully constructed in such a manner that the batch processing functions we must perform against those same data will be efficient.

Let me illustrate the environment of the company a little bit better. We have ten major manufacturing plants operated by the chemical company. We also produce chemical products on behalf of the chemical company in ten major refineries and terminals of the parent oil company. We have sixty warehouses in which we inventory packaged goods; these are nearly all public warehouses, which is another one of the interesting facets of the operation. The number of orders per day is only about a thousand on the average; it peaks at about two thousand currently. We expect by 1977 to be peaking about the five thousand mark. We have about 25,000 customers across the country. They order from one product to as many as two hundred products per customer. We of course want to store the repetitive product information in the customer menu so that we can readily supply to the customer service assistant the specific descriptions against an English language description that he or she enters for those goods that the customer repetitively orders. When we are placing an order in the data base, we want to be able, where necessary, to check credit, to price the goods, and to know whether the inventory is projected to be there at the time that the shipment is expected to be rendered for on the customer's behalf.

We have seasonal lines of goods where we move everything we move in the whole year in ninety days. That is terrible for the manufacturing facilities. We offer the customers purchasing incentives if they buy months and months in advance. We used to get those pieces of paper six months before the season and then managed to lose them in file drawers. One of the major features of the order transaction data base is the ability to take an order, validate it, acknowledge it to the customer and leave it there until ten days before the shipment is scheduled to be made on the customer's behalf, then release it automatically as a shipping order and a packing list to the warehouse for fulfillment.

Since the pre-ordering process causes a lot of difficulty, why do we want to do all of this? Well, we had trouble associating the expected distribution activity on a predictive basis with the status of the market intelligence being gathered by the customer service assistants and the sales people talking to the customers or their representatives. We wanted to more closely associate the marketing department with the distribution function. We wanted to achieve maximum order accuracy because the order contains 75% to 90% of all the data needed through the whole life of the transactions, all the way through crediting the customer's payment back to the open line item in the receivable ledger. We wanted to improve the productivity of the order placer. With the new system in place in all of our district offices, if the order placer has a misconception as to what the primary shipping origin is, if that shipping origin does not have the goods that the order placer asks for, or if there is a question about the price, we return it to the customer service assistant. Someone sitting in corporate headquarters is not second guessing the customer service assistants' knowledge and understanding of the business. We have significantly upgraded the quality of that particular position in our marketing department. Whether anyone else in the system likes it or not, if the customer service assistants say they got a better job out of it, we have won a major battle.

I wanted to illustrate only the one point that we are associating, as transactions proceed, multiple data bases. The inventory data base is a physically separate data base, organized by warehouse and by product, with a projected availability of goods. The order processing system is a data base that is organized in a totally random sequence by order number, which is a computer generated random number. We can, however, using pointers that are created in the data base, enter by customer, using a brief phonetic address, to find all the outstanding randomly assigned order numbers assigned to that customer. One of our update features is to create, within the data base, the pointer structure that leads us from the customer to his orders. We do, though, want to associate these very large data bases, one with the other.

I will now address myself to queries or inquiries. I want to illustrate what I mean when I use the word "structured inquiry." This (transparency) is a structured inquiry by my definition. It says to the product representative or the customer service assistant "Do you want a particular rail car status? If so, give me the car number. Do you want a particular order number and the cars associated with that number?", etc. There are pre-formatted screens in our system for presenting those data that meet these search criteria that are extracted from the data base.

Out of this exercise that we have just gone through, do I have any conclusions as to what our user needs in the data base management area? Absolutely! I am tremendously opinionated. I hoped by this brief description of our product to illustrate some needs. We want, of course, good teleprocessing capability. On a strong teleprocessing monitor, we want responsive direct access to the data base to allow us one time source entry to validate and correct the data, to balance if it is a supply system, and to minimize the data entry by storing all repetitive data and recalling it from the data base rather than having it entered by any means at all. In other words, we want a good, strong, responsive interactive teleprocessing capability.

Data Accessibility

There are two kinds of users:

1. The guy that runs the business, the customer service assistant, the product representative, the marketing representative, etc.

2. The DP user.

We will never build any data base management systems for ourselves. We are going to find vendors that will bring them to us or software houses that will sell them to us. So we have our DP professionals who write applications, true applications, systems on top of the data base management system. Then we have the end user who runs a piece of the business with those applications.

Let's talk first about the guy on the firing line. We want the capability, as I said, to have physically different data structures and to be able to logically associate them responsively at decision time. We want to have effective, immediate inquiry and display in the teleprocessing mode, both by structured inquiry and a query language which uses a data dictionary. We don't like to keep entering repetitive data everytime we want to write a display, but we do today. We want a user oriented English-type language that will enable the user to obtain a series of displays on all the complex information he needs to know. We have obtained the data dictionary from another vendor. We want flexibility and ease of use for the DP professionals. Of course these are the things that relate to structuring the big batch processing applications, because those are still in the hands of the DP professional, not in the hands of the end user. The end user controls the information he wants. We use systems, like Mark IV, which basically require a compile every time we execute a retrieval request. It is inefficient with certain data base structures and certain access methods within the data base structures. These are things we want for the DP professional.

I particularly want to discuss a point that was discussed this morning. Of course we want performance; we want everything to happen immediately at one-tenth of the cost we pay today to have it done. However, particularly important are:

1. The data base build and housekeeping functions. They are very expensive at times.

2. Ability for both batch and teleprocessing update on either random or sequential bases.

3. Fast and excellent performance in both modes.

We do not want to spend too much time programming to pay for any of these things either. It is the same on retrieval, of course.

Data Security

Nothing in God's world is certain or ever will be. That is the essence of security. We have taken the trouble in a few areas to force the necessity for collusive action in order to access a particular data base without pre-established privileges. We can force that collusive action to be taken by two people, and that gives about 10% of the risk as when it took only one. We can force it to be taken by three people, even, if we choose, and that will cut the risk by another order of magnitude. It is a question of how far you want to go. What we have chosen to do for ourselves is to institute "threat monitoring." This means that we are monitoring every time someone threatens to try to exercise a privilege he shouldn't exercise. These are after-the-fact controls. But I will guarantee you that there are some files you will not get into but once. I don't care how well you know the system. You will get in the first time, I grant, but you won't ever make it the second time.

Data Integrity

We need a lot of help in this area, particularly from the vendors and software support people. Teleprocessing support is inadequate in every system that is on the market. We can't have the choice of devices; we can't have the range of speeds in printers; we can't have the range of speeds we would like in keyboard devices; etc; etc. These are user needs in the data base management area.

Smith: I wish that we had another hour and a half because yours is certainly an interesting system. I also wish that we had a security seminar. I think that Shell has an outstanding system. I don't know if any of you have heard about it, and maybe they don't want anyone to hear about it. They do a lot in the area of security.

Panel Discussion

Helen Ligon, Associate Professor
Department of Statistics
Baylor University
Waco, Texas

Ligon: This is such an interesting area, and I feel like we in the academic world, for many reasons, don't know nearly enough about data base management. I was trying to find something to say to match Bob's excellent presentation, so last night I read in a book entitled Data Base Management that the software graveyard is filled with data base management systems. Also, many data base management systems are built on the rubble of previous devastations. This is a hotly debated area of controversy, emotion, and vendor manipulation. I thought that was quite interesting. I think most of us are interested in what data base management systems are available to use, and do any of them really fit the bill? Bob, could you tell us something about that.

Griffith: There aren't any that match the list of capabilities that we would like to have. We started this project in the summer of 1973, and we needed to buy applications software, if possible. The programming is large, and it so happened that there was one vendor in the market with applications software--McDonald Automation Company--that addressed the order processing area of our desires at a relatively good price. They had based their product on IBM's product IMS. Plus, IMS does have a fairly healthy and flexible teleprocessing monitor. So, it was, at that time in history, a one horse race. Remember I said we had a user manager committee asking for a proposal for a new systems evolution. We took a calculated risk that IMS was a suspiciously good product, and that we could, in fact, survive this three-year evolution that the project view graph I showed represents with that product. We are into the project just over a year and a half, and I feel that the risks are probably less now than we thought they were then. Certainly there are many things that I would like to see: a good query language; more efficiency in batch retrieval; a better user language for addressing the data base using a dictionary naming convention for the data elements and using the attributes of the data elements that are stored in the many control blocks one has to build to make a system like this function. There are many, many things I would ask that should be added to a product like IMS. On the other hand, we have looked at a number of other systems. In our corporation, we are going through a great debate as to whether we can in fact afford a second large-scale data base management system because we have some applications, not connected with this one, that require that much heavier batch retrieval requirements be satisfied. And, we are not satisfied with that particular aspect of IMS. We may well implement a second data base management system. We are looking at such products as Adabas and System 2000.

Ligon: Since part of us are academic people as well as people from industry, I was listing some of the problems we would have with data base management. I am in the school of business, and right now we require one basic course for every person who gets a Bachelor of Business Administration degree from Baylor. In this course we try to give data base concepts and the basics of computer science. One of our big problems in the academic world is that we do not know what is going on in industry, yet we need to know. How can we know what to teach our students as far as data base management is concerned?

Griffith: For the systems analysis and development activity, we hire graduates in business, engineering, mathematics, computer science, and I suppose if we had the opportunity, graduates in any other field. We like, as has been mentioned earlier today, simply well-rounded people. We don't particularly care, in the main, whether they have their degree in computer science and a minor in some other field or vice versa. In systems analysis development though, we hire only those who have a major or minor in some area related to the use of the computer. We do not give them formal training when they arrive. We assign them, in the main, to active project teams where they can be given contributing assignments under the direction of someone more experienced and fill in specific training requirements, such as IMS programming, data base design concepts or whatever. With in-house training courses, we have a training department with a full-time staff of eight to twelve professionals that are capable of giving courses in almost any technical area in which we want to upgrade the training of a particular individual. We have people with 20 years' experience who go back for a couple of weeks of schooling in a new topic with which they have not had a chance to become familiar in the course of their job assignments. We do the same with new people. So I guess we want smart, well-rounded people who have some background in computer concepts. Teach them the concepts of data structures. Teach students the concepts of languages as they might be applied to a data language with which one can address a data structure, rather than teaching them specific products. We might be using a different product than you might use to teach them concepts.

Ligon: Do you think that it is important that students actually do data base management? I was talking with Professors Harris and Gaitros from Baylor and they said if you've got a data base management system on your computer system, you have got to use that one to teach. But do you think it matters whether it is just any data base management system?

Griffith: I don't think it matters which one from our point of view, because we may change our minds and use two or three.

Ligon: What about the current state of the art? What you want seems sort of high in the sky. It sounds beautiful but do you think it can be accomplished?

Griffith: Probably not. What I want is a complete network management tool. I want to supervise several different kinds of external networks and communications control computers, a main frame processor, and a very large hierarchical array of storage devices. It probably is not possible to put it all in a single body of software; but the more we get, the more we will use.

Ligon: My principle purpose in many of my courses is to work with people who are going to be managers. They are not going to be computer people. We have talked so much this morning about the communications gap. What can I teach my students as managers that will help them to work better with the computer people?

Griffith: We offer a data processing concepts course to non-data processing people in our own company. It is an intensive course introducing them to some of the data processing buzz words and the concepts that those buzz words denote. But I am not sure that I believe it is truly satisfactory; in fact, I know that it isn't. I don't think I am capable of answering your question simply because attitude governs the degree to which an operating manager is willing to understand the tools that his own people have to employee to perform their functions. If you send us open-minded people, they will learn to understand the tools their people use.

DATA BASE MANAGEMENT AT THE REED TOOL COMPANY

Billy E. Smith
Systems Project Manager
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INTRODUCTION

I have divided this presentation into three parts: History, Uses, and Problems of Data Base Management at the Reed Tool Company. Although the comments made in this paper derive mainly from my experiences at Reed, I believe that they also apply to the majority of data processing installations, particularly manufacturing companies. This presentation, I hope, will give you a better understanding of the requirements of business and industry concerning data base management.

I did not include a section on the need for data base management, since that subject is covered quite thoroughly in the sales literature of any of the data base management systems. However, if you would like a more objective view on the need for computer data bases, I would highly recommend the Harvard Business Review article mentioned later in this paper.

HISTORY

In the beginning there was no definitive plan, only an opportunity and an idea whose time had come. Things had changed quickly and dramatically at the Reed Tool Company. New owners, new management, and new policies provided a fertile environment for change and improvement at the beginning of 1973. The new management believed in the capabilities of computer systems to help solve business problems and was willing to lend us the money and other support needed to fullfill those capabilities. We in the Data Processing Department knew where we wanted to go but not how to reach that goal. IBM had prepared a comprehensive blueprint of an integrated computer-based manufacturing control system called COPICS (Communications Oriented Production Information and Control System) which we felt was needed at Reed. Although the basic information was available in eight volumes from IBM, the application programs and other software were not available. We were forced to find or create our own software to implement the COPICS concept. And the heart of the whole system was an integrated data base organization. With the help of a very timely article in the September 1973 Harvard Business Review entitled "Computer Data Bases: The Future Is Now" by Richard L. Nolan, we were able to convince the Reed management that a good data base system was a key part in achieving the goals of the company.

We already had two major systems in the planning stages and needed to make a decision regarding a data base management system as quickly as possible in order to continue with those projects on schedule. Time was short but we knew the critical elements we required in that system. Was the system compatible with our current and future hardware and software? Was the system flexible? Was it proven in actual use? Was it efficient and also easy for programmers to use? We looked to both IBM and CINCOM Systems, Inc. for a data base management system. At that time, IBM did not have anything for a small DOS user that would even come close to our needs. We spent the month of September evaluating TOTAL against our requirements and found a remarkable correlation. TOTAL would operate on our IBM 370/135 with 96K under DOS or DOS/VS or even OS. It would work with our main programming language ANS COBOL and also with ALC, our secondary language. I talked with several users of TOTAL and they were not only satisfied with its performance but also enthusiastic about its use. We took a very practical approach in evaluating TOTAL. We wanted a data base system that would help us do our job better today, next year and also five years from now. We did not have the time to ask every question about TOTAL, to perform extensive benchmarks, or to evaluate all the other data base systems. So, when we found that TOTAL met our basic requirements, and met them quite well, we bought it and hoped for the best.

Next came the task of actually installing and using TOTAL, but to do that we needed a little more education. Again, a very timely event occurred, for CINCOM sponsored a convention of its users and its own personnel called Knock-About, the second week of October 1973. We attended this three day meeting, talking to users and CINCOM representatives, and learning as much about TOTAL as we could from the people who knew. We learned how to do the things we wanted with the framework of TOTAL and returned to Houston with some definite ideas on how we would like to implement our Data Base Management System. We did not know all of the answers or even all of the questions, but we did know our basic goals and we set out to achieve them as best we could. We had recognized a need for a Data Base Administrator although we did not know everything that a DBA should do. Nonetheless, we appointed an experienced and hardworking programmer, Perry Jones, as our DBA. He has performed admirably in the job as a technical expert on TOTAL and also in designing and programming one of our enhancements to TOTAL, an interface called the Reed Data Manager. Although TOTAL is relatively easy to use, we felt the need for an interface to TOTAL which we could tailor to the specific needs at Reed. Since we had a relatively new and inexperienced programming staff, we designed the Reed Data Manager to allow quick and easy access to TOTAL files with built-in checks to avoid any errors which could accidentally destroy the integrity of our data base. It also allows us immediate access to a set of TOTAL test files with minor changes to some control cards in the JCL. The Reed Data Manager not only gives the programmer additional features not available directly with TOTAL but also reduces the amount of coding required and the number of mistakes which the programmer can make in using TOTAL. Our foresight in appointing the DBA and in providing the interface has proven itself on many occasions in the implementation of Data Base systems. Our first TOTAL system, a new Work-In-Process System, was installed in January, 1974. Currently we have five major systems installed and one being installed with a data base of twenty-eight integrated files. All of this has been performed in about sixteen months.

We have made a lot of progress in many different areas during these past sixteen months and all along the way TOTAL has helped us. The number of files in our data base has increased from three to twenty-eight. Our operating system has changed from DOS to DOS/VS. We have converted from eight 2314 disk drives to six 3330 disk drives. Our core capacity has more than tripled. We have increased the programming and systems staff from ten to seventeen people. In January, 1974, we installed the Environ I teleprocessing monitor from CINCOM. For our users we have replaced out-dated weekly and monthly reporting systems with daily updates and CRT displays of all the files in our data base. These new systems have been mainly in the critical areas of Inventory Control, Work-In-Process, and Purchasing. We also have a Material Requirements Planning System in the pilot testing stage and several new systems in the planning stages, all of which rely heavily on our existing data base. With our Data Base management system we have reduced our data redundancy and increased our ability to respond both quickly and accurately to the needs of our users with correct and current information.

USES

We have applied the concept of integrated data base organization in many different areas and received a wide variety of benefits from those uses. At first, we looked for those application areas which would provide the most direct time and money saving advantages for our company. In a manufacturing company, those high payoff areas are normally related to Production and Inventory Control and so it was with us. We converted our existing Item Master file, Bill of Material file, and Labor Routing file to TOTAL files as the nucleus of our data base. At the same time we designed new files and new systems for Inventory Control, Manufacturing Work-In-Process and Standard Cost. After these systems were operating properly we expanded our data base by designing additional files and improved systems in the areas of Purchasing, Labor Reporting, and Material Requirements Planning. Many of the systems were prerequisites to the MRP system and MRP is a predecessor of a Shop Scheduling system. Many of these different applications are related in a similar manner. This makes a data base approach a real necessity if the various systems are to interact smoothly and effectively. A data base management system provides a very good environment for ordered and modular growth; in fact, it even enhances and encourages that type of growth.

In addition to enabling us to install many new systems in a short period of time with a minimum of conflict, data base management has provided several benefits within each of those systems. I would like to discuss four of these benefits in more detail:

1. Comprehensive editing.
2. One time updating of information.
3. Control of input data.
4. Integrity of output data.

Much more comprehensive editing of transactions can be performed since all of the information within the data base is available to all of the programs accessing any part of the data. For instance, an inventory transaction may affect not only an inventory balance, but also a Work-In-Process order, a purchase order, and/or a sales order. And all of this information is readily available to the program which must process that transaction. After a transaction has been edited for validity, it need only update the data one time. Since there is no need for data redundancy within a properly constructed data base, there is no need to update the same information in two or three different files. We formerly had separate, and in many ways duplicate, data stored on various weekly and monthly Inventory and Work-In-Process files. Now, the various data elements are stored only once within the data base and are consequently updated only once when a change occurs. The first two benefits also contribute to the third benefit which is the control of input data. Since the volume of transactions is reduced and each transaction can be edited completely as necessary before it is applied, there is a decrease in the number of transactions which update the file incorrectly. And when an error does occur it is usually quickly and easily corrected by a single transaction. The better input data leads to better output data. You can depend on the data within the data base being accurate and current. There are no discrepancies between the inventory balances which are reported to sales, inventory control, and accounting since there is only one set of inventory balance data within the data base. There are no cases of "multiple versions of the truth" which exist in so many computer systems which maintain redundant data. All of these benefits combine to provide the most important benefit, that is, accurate, complete information provided to our user departments in a timely manner so that they can make decisions regarding the operation of the company.

Our use of a data base management system has also provided some secondary benefits, particularly within the Data Processing department. I believe the following three items to be particularly useful: improved programming discipline, more complete testing, and easier conversion of files and hardware. A data base system requires some discipline concerning the definition and accessing of the data within that system. We expanded this discipline through the use of our Reed Data Manager interface so that common I/O routines and data names must be used in accessing the data base. But we also made use of these common items quite easy by having them all precoded, so that needed elements are simply copied into an application program with a few lines of code. These common labels provide a useful point of reference for a person unfamiliar with a particular program and make modification and debugging much quicker and easier. The Reed Data Manager has also made testing of programs much more comprehensive than was possible before. We have established a test data base with a small number of records in each file. This test data base can be updated with a new version of a program quickly and without endangering the production data base. This provides quick turnaround on tests, no interference with production work, and better tested programs. And all of this is handled through JCL with only a few cards, and no changes to the source programs. Likewise, conversion from 2314 disk drives to 3330 drives was a relatively simple procedure. It required changing a few parameters in the data base system, relinking the applications programs, and loading the files onto the new device. The data base management system provided "device independence" and made changes to and recompiling of the application programs unnecessary. We have also changed the size and location of files, expanded the size of the records within a file, and rebuilt files with very little effect upon the programs. In most cases, only a relink was required, although in a few instances, a recompilation was necessary even though no changes were required in the source program. "Change" is a way of life in a data processing department. There are always changes in hardware, operating systems, user requirements, application systems, and programs. One of the most important advantages of a data base system, is in making those everyday changes as quick and as simple as possible.

We have found that a data base management system is a tool, a very useful tool. It is not limited to the simple mechanical task of maintaining thousands of data elements in structured logical relationships on direct access files. A good data base system is a flexible tool which can help solve a variety of problems, some of which I have mentioned. But those are by no means the full range of its abilities. A data base system is as useful as your ambition and resourcefulness can make it.

PROBLEMS

Even though a data base management system has made our jobs at Reed easier in some respects, it has not eliminated all of the problems from those jobs. Indeed, it even created some new problems. There was no ready-made solution to any of the problems we encountered, but each problem was solved with the application of some careful analysis and diligent work. For example, one of the first problems we faced was the conversion of our Item Master, Bill of Material, and Labor Routing files to TOTAL. We solved this problem with a combination of remedies such as: writing bridge programs to transfer data between the old and new files, initially loading the new files from the old files, changing the programs manually, and implementing each individual program after it was tested on the new files. Another problem was the lack of any parameter driven utility programs to load, unload, move or rebuild the data base files. After some deliberation, we simply wrote our own utility programs and we no longer have to worry about this problem. There was also no automatic backup and restore procedures for the data base files. Again, we solved this problem by establishing our own detailed procedure for backing up and restoring our data base files using a high-speed dump/restore program. As I mentioned before, we installed the Reed Data Manager with the built-in procedures for handling a test data base. This was due to the lack of any provision within the data base management system to adequately test programs without jeopardizing the integrity of the production data base. Although the data base management system did not contain every feature we wanted, it did allow the flexibility we needed in order to do those things. It did not fence us in with its features, but instead allowed us to use its features and expand upon them as we saw fit.

This leads me to the general problem of selecting a data base management system. Since there are many such products on the market today, it might seem that this would be a very time-consuming and difficult task. I do not believe that is necessarily true. Although the number of products is large, many of them are specialized, just as many potential users' needs are specialized. Some data base management systems will run only on very large computers, others will run only on certain manufacturers' computers, while others are designed to perform only limited applications. The potential data base user must first determine the few data base systems which will fit his environment. He should then investigate those systems very carefully to determine which of the systems can best serve his needs. Probably the best evaluation can be performed by talking to actual users of the various systems, particularly those in the same industry, with the same type and size of computer, and the same application areas. A visit to one of the installations would also be quite beneficial. In addition, I believe that any generalized data base system should offer these four features: modularity, flexibility, ease of understanding, and simplicity of use. By modular, I mean that is should be able to grow in steps as your needs grow. When new data elements and new files are added to the system, they should have very little impact on the existing data base. As the installation grows, the data base system should grow also, with the various changes in hardware and software. I believe the system should also be flexible in allowing the user to include additional features which are not an integral part of the data base system. The data base system should allow for differences in the users' needs and not unnecessarily restrict his actions. And finally, I think that the easier a system is to understand and to use, the more and better use it will receive. By following these suggestions, I think a potential data base user can find a good data base system and start enjoying the benefits of an idea whose time has come.

Education is the final problem area which I would like to discuss, since I know it is of particular interest. This is an area with great potential for improvement in the next few years. In most companies, data base management is a new concept, and only an idea or a buzz word. There are not that many experienced and successful users of data base management, and most of the users are still learning about data base philosophy from their own experiences. There is a great deal of interest in the new concepts of data base management, but few authorities to expound on the subject with real knowledge and insight. Now is the time to begin teaching the basic philosophies of the data base concept, of shared, interdependent, non-redundant, device-independent, and program-independent data elements which are one of the major resources of any company. The education process needs to include all of the people in the company, from the clerks to the president, who input or use the data from the company data base. They need to understand the interaction and interdependence of all the elements in the data base as a resource important to everyone in the company. More specialized education needs to be given the members of the data processing departments, so that they can properly prepare for and design the data base systems in their futures. Although data base management is a relatively new field with much to be learned, I believe there is much that can be taught on the subject now.

Panel Discussion

Dr. Olin Johnson, Head
Department of Computer Science
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Houston, Texas

Johnson: Before I ask Billy some questions, I would like to give some references. We have not said too much about references today. I think the following are some good references on data base:

1. A book published by the University of Houston as a result of a Data Base Conference held in November, 1974. If you are interested in obtaining a copy of this book, write to me in the Computer Science Department, University of Houston. The motif of the conference was to get the manufacturers of various data base systems together with users of the systems. The presentations were of the following format: A representative of the company that sells the data base package would give a presentation on his experience in using the package. In this one book, there are six of the most important data base packages presented together with statements from the users about these six packages; so it can save a lot of looking around for information about data bases.
2. In the September 1974 issue of Datamation there is a special section on data bases. It has several very good articles on the topic. One of the articles, "We Bet Our Company on a Data Base Management System," is particularly interesting.
3. The article that Billy Smith mentioned to you is the Harvard Business Review article of September 1973.

In looking at the data bases that are in this book published by the University of Houston and the ones that are in Datamation, I notice that all together there are eight different data base management packages mentioned. Only four of these are from the manufacturers. The other four are from independent software companies. Thus, I think that it is important if you are looking for a data base management package to look not only at what the manufacturer offers, but also at the independent companies because they have been very successful in this particular software area.

In going through the Datamation article, I wrote down a list of problems associated with data base management. I thought that I would structure my questions to Billy along the lines of these objections to data base management systems. Not all of the objections mentioned in Datamation are applicable to Reed Tool Company's situation.

For instance, the first objection I have listed is that they are all COBOL oriented. Most data base packages assume that you are going to use COBOL, so they start off with some enhancement to COBOL. They are not universal in that sense, so that if you have a shop that is doing FORTRAN applications, PL/I applications or something else, then you may have a hard time finding a data base package that interfaces with that.

The second problem that is pointed out if you are going to go to the data base administration concept is that you need a higher class of programmer. You are dealing with a more complicated entity here, and you cannot get a simple, cheap programmer to come in off the streets and deal with the system. Now, what is your experience at Reed--was the extension to TOTAL you wrote an attempt to get past the fact that the programmers were not as well trained as they should be? Have you found that in using a data base system you need a higher class of programmers?

B. Smith: Not really. Our programming staff, as I mentioned, was relatively inexperienced. We wrote the Reed Data Manager interface not so much because TOTAL was so difficult to use that we needed a higher class of programmer to use it, but rather to make the job of the programmer, whether he was experienced or inexperienced, easier for him to do and to take away a lot of the redundant work, to add special features that we wanted to enforce within Reed, and make them automatic so that someone did not have to do them every time. I do not think that there was any requirement for a more experienced programmer, with or without an interface.

Johnson: It has been said that one of the problems with data base systems is that you need more hardware to implement these systems. Is that your experience?

B. Smith: Yes, in one respect, I guess you could say that it requires more hardware. We did increase our hardware considerably. We chose a data base system particularly that would grow with the hardware. But the hardware growth was not so much to do things the same. We aren't getting the same results that we were getting before; we are getting much better results, much better information back to our users with the data base system and with the associated increase in hardware than we could have gotten with what we had. So we are getting more out of the additional hardware.

Johnson: Another objection raised to data bases is that errors are potentially more dangerous; so that when an error occurs, it can be a disaster.

B. Smith: We have not had any disasters. We have had a few foul-ups where some of the data was destroyed or where some of the data did not coincide with other data we had stored. We have been able to recover from it fairly easily. So far it hasn't proven to be a real problem.

Johnson: What about system overhead? Surely with a data base you have to be careful about the integrity of the data base system so you have to do a little more checking and maybe as one program is working, you have to keep track of all the changes that program is making to the data base, at least until that program is finished. Do you feel that system overhead is significantly higher with a data base?

B. Smith: Undoubtedly, yet it is higher. In fact, the Reed Data Manager that we instituted has a considerable overhead of its own. Even so, we feel we are getting more benefits out of it in the long run, and we are willing to pay for it.

DISCUSSION FROM FLOOR

Gensler: Mr. Griffith, I have always been rather concerned about keeping up with standards and am always glad to see that we still have standard FORTRAN and standard COBOL. I understand that CODASYL has a task force dealing with standards for data bases. I wonder if a company like Shell participates in the development of these standards because it certainly has a great deal to offer.

Griffith: We are not represented on the committee. We do have representatives on most of the user groups that are associated with either UNIVAC or IBM hardware installations, and we have made contributions specifically through GUIDE, SHARE, and those kinds of organizations. As far as our own programming practices, I think we are about to decide that, in order to control the impact of one applications library on the response seen by another segment of the company's operations, we will impose internal standards.

Gensler: I think it would be to the advantage of industry as a whole to share some of that information.

E. Smith: One of the things I don't know if you people have caught is that the commercial side of Shell must have three 168's and a couple of 145's. I think Reed has a 135 with 320 K. Shell has about one hundred 330's. So there is quite a contrast even though both of them use a data base management system.

R. Smith: Several times today we have had questions in the academic field concerning "What do we do." I think we have just hit upon an area that doesn't require a lot of machine time, in fact none. It does not require many disks, like zero. We are going now into the area called data base management. We are involved in it in our funny farm, too. We are looking for a set of standards. We think that is the only way we are going to stay alive. We will be using IMS also, but we have got to have a set of standards. We have talked today about training people that come into our shops. Actually our training process is to hand them our standards manual and say "Hey, let's get with it." The academic folks are supposed to know how to work all of these words, and so would it be possible that some work be done in the standards area. All it takes is an understanding of what is going on, paper, a pencil, a glib tongue, and maybe we could get some help to start out with a set of standards in a field that is really going to get messed up if we don't have them. I would challenge you to consider that as a possibility.

Randell Whaley, East Texas State University: I would like to direct this to Billy Smith. In the system you are talking about, what measures do you take to anticipate, in five years, a new application being added to your system, or maybe a new file created that you do not plan on now. How do you make allowances for that? I understand that these systems are very difficult to change once you have them designed and installed.

B. Smith: Some data base systems are. The particular one we use is not. In fact we started out with three files of particular types of information. Since that time we have increased it to 28 and we have about five or six more that are anticipated within the next few months. If additional information is needed within a particular file, it is a very easy job to add that new information and reload the file. It is only that part of the data base that has to be redone, not the whole thing.

E. Smith: In closing, I think that we have given you food for thought, whether you are in the academic or the commercial side of the house. I think that those of you who haven't gotten involved should do so because the data base management systems that are being evolved today will affect us for a long time. We should all see what the CODASYL committee is doing, and there are other areas that we ought to look into.

OVERALL MANAGEMENT OF HARDWARE, SOFTWARE, PEOPLE AND DATA PANEL

Panel Chairman: Ronnie Ward
Associate Professor
Department of Computer Science
University of Mississippi
University, Mississippi

Introduction

Ward: The purpose of this panel is to disucss Overall Management of Hardware, Software, People and Data in various computing environments. We want to consider the management of these essential elements in a data processing environment. This includes the equipment, programmers, analysts, and users of the operations.

THE MANAGEMENT OF HARDWARE, SOFTWARE, PEOPLE, AND DATA IN A LARGE COMPUTER ENVIRONMENT

J. Dennis Cogan
Manager of Corporate Software
Electronic Data Systems
Dallas, Texas

OUTLINE

I. INTRODUCTION

- A. Electronic Data Systems
- B. Type of Business
- C. Growth Rate
- D. Facilities Management
- E. The Future and The Challenge

II. TECHNICAL STATISTICS (THE CHALLENGE)

- A. Snapshot
- B. National Scope
- C. Communications Network

III. EDS "CORPORATE SERVICES DIVISION" (THE SOLUTION)

- A. Introduction
- B. Organization Chart
- C. Technical Planning
    - Communications Network
- D. Hardware Management
- E. Software Support
- F. Microfilm, Forms and Supplies
- G. Data Preparation Services
- H. Summary

IV. ACADEMIC EMPHASIS FOR THE FUTURE

INTRODUCTION

Identification of Firm

Electronic Data Systems (EDS)
7171 Forest Lane
Dallas, Texas 75230
Telephone Number: 214/661-6000

Electronic Data Systems is a publicly owned corporation listed on the New York Stock Exchange under the symbol EDS. It was founded by H. Ross Perot and incorporated in Texas on June 27, 1962. Since its founding in 1962, EDS has become a national organization with over 3,500 employees located in 35 cities throughout the United States and Puerto Rico.

Type of Business

EDS provides total facilities management relating to electronic data processing. EDS designs, programs, installs, operates, and maintains management information systems under long-term fixed-price contracts with large corporate customers in the health insurance, life insurance, banking, credit union, retailing, and other industries. The operation of the electronic data processing system is only a part of EDS' services. The function of data processing in business is to enable a company to provide better products and service to its customers for minimum cost. As a consequence, EDS performs a wide range of services to assure the successful marriage of the electronic data processing system with the clerical, administrative, and other operations the customer performs in managing and controlling his business.

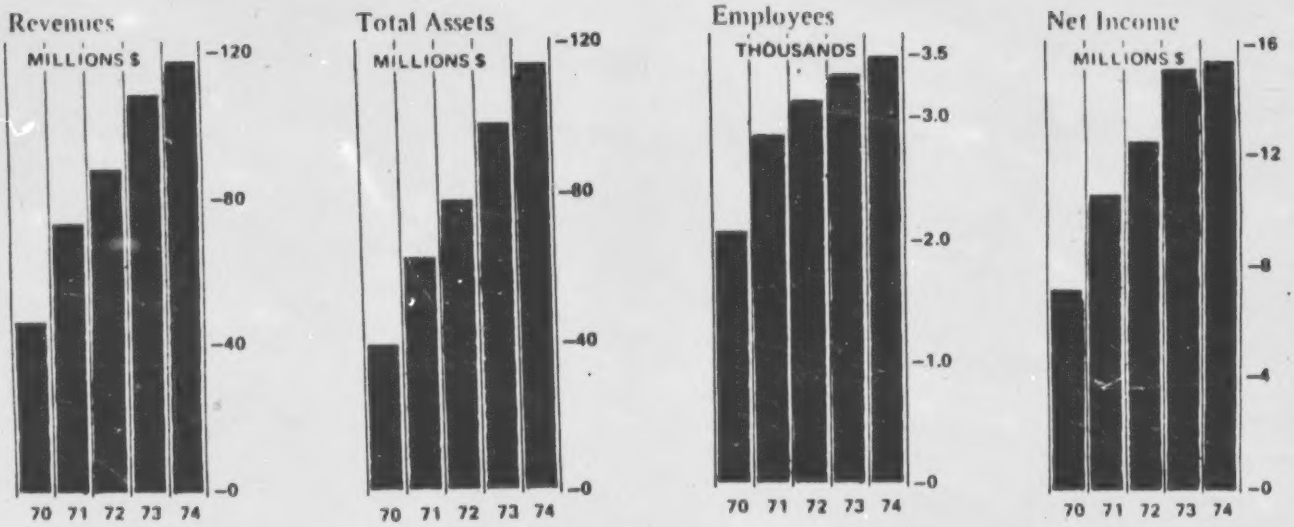
Rate of Growth

The graphs illustrated in Exhibit 1 show the growth of EDS over the last five years. It is presented at this point not to demonstrate the success of EDS as a company but rather to show how effective the individual techniques discussed later in this paper have been during periods of rapid growth and technological change.

Facilities Management (FM)

Definition and Scope. Facilities Management is a comprehensive information processing service that is provided to a company, generally for a fixed cost, in which the information processing specialists of an outside facilities management firm assumes some degree of line responsibility (generally total responsibility including equipment, people, and functions) for the electronic data processing operations of a user company. Typically, this service is provided on a long-term (1 to 10 years) contractual basis for a fixed price plus incentives and involves some degree of responsibility assumption, ranging from solving a specific application problem to complete assumption of the

EXHIBIT 1



entire data processing function. Additional services including industrial engineering, work measurement, and operations research are provided by some of the more prominent facilities managers to help streamline the entire operation of the user company.

Advantages.

1. Equal or less costs, fixed over a long period of time.

   - Development costs shared among customers.

   - Economics of scale can be taken advantage of by combining hardware into massive regional computer centers.

2. Contractual guarantee of performance and results.

3. Highly qualified EDP professionals can be attracted to and retained by FM firms due to the broad scope of their data processing activities.

4. Economics of new technologies can be rapidly exploited.

5. Industry-Center concept of organization within FM firms allows advantages of:

   - Similar problems and solutions.

- Intensive industry oriented specialization.
- Responsiveness to industry wide change.

6. Geographic flexibility since FM firms are organized along industry-center lines.

The Future and The Challenge

The preceding background information on FM and EDS was presented for two reasons: The first of which was to point out to students of data processing, both professional and academic, that the facilities management concept, while relatively new, has been widely accepted in all phases of the economy. Furthermore, based on its history of growth, it appears certain that FM will be playing an increasingly significant role in the future of data processing.

Secondly, while I have mentioned some of the commonly accepted advantages of FM, I must also point out the tremendous challenges to the FM firms to assure that the advantages are realized.

E.g.
- Long-term fixed costs to the FM customer demand ever-increasing efficiencies on the part of the FM firm.
- The contractual guarantees of performance demand a consistent and outstanding level of performance by FM personnel.
- Regionalization with the inherent economics of scale demands that the FM firm be capable of efficiently operating giant computer centers with national teleprocessing networks.
- The FM firm must be keenly aware of potential technological change and formulate conversion and migration plans on a timely basis.
- Development and standardization of sophisticated software products is a necessity to facilitate all of the above.

TECHNICAL STATISTICS (THE CHALLENGE)

Snapshot

The following pages show the scope of EDS' current national operations. Computer hardware locations and the communications network are graphically displayed.

Some of the more significant aspects of the enclosed charts can be summed up as follows:

- Currently operating five regional centers.
- Currently operating 42 customers out of regional centers.
- Consolidated 45 data centers within last four years.

- Presently operating over 100 teleprocessing circuits, ranging from 2400 BAUD to 50 KB.
- Over 900 CRT devices and 52 hardcopy devices are connected to the teleprocessing network.
- Maintain inventory of 86 computers with 10,652 individual components.
- Hardware vendors represented at EDS include IBM, Honeywell, Burroughs, RCA, CDC, NCR, etc.
- IBM mainframes installed include 360-20, 30, 40, 50, 65; 370-135, 145, 155, 158, 165, 168.
- IBM operating systems installed include DOS, DOS-VS, OS-MFT, OS-MVT, VS1.

EDS "CORPORATE SERVICES DIVISION" (THE SOLUTION)

Introduction

Corporate Services Division is the corporate support organization for EDS. It is comprised of specialized service groups who support all divisions of EDS in matters of technical nature. This support comes primarily in the area of hardware, software, technical planning, and teleprocessing rather than in areas related to application expertise. While each group within Corporate Services has a very specific set of responsibilities, the key to the success of the entire division is the integration of all ideas into a viable plan which assures growth and economic benefits.

Organization Chart

Corporate Services Division

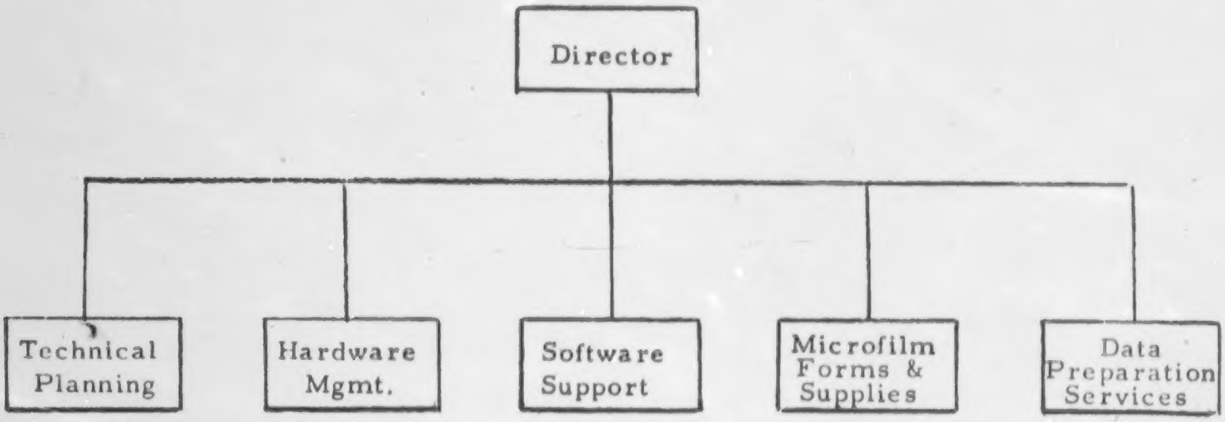


EXHIBIT 2

COMPUTER HARDWARE

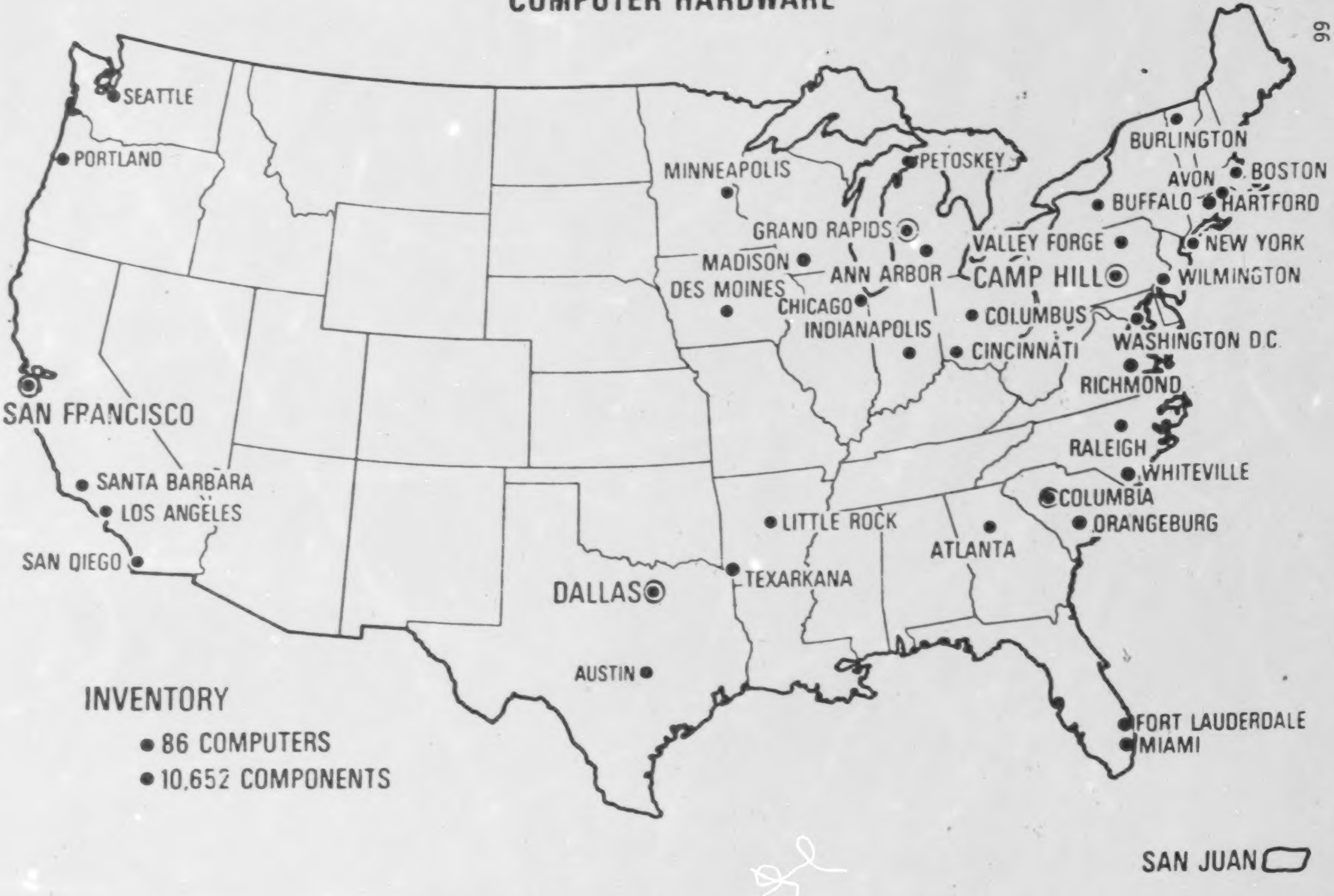
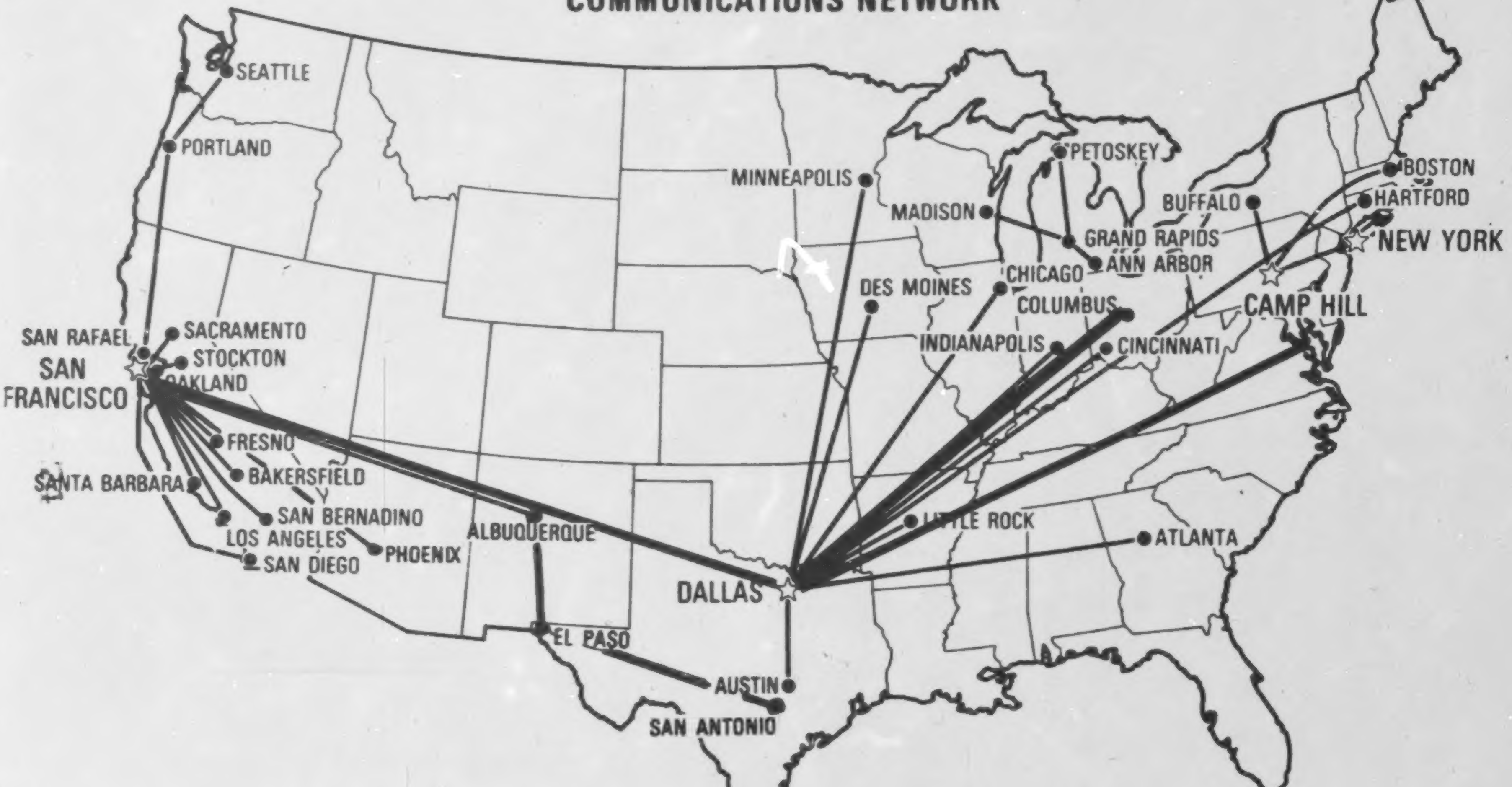

SEATTLE
PORTLAND
SAN FRANCISCO
SANTA BARBARA
LOS ANGELES
SAN DIEGO
MINNEAPOLIS
PETOSKEY
GRAND RAPIDS
MADISON
ANN ARBOR
DES MOINES
CHICAGO
INDIANAPOLIS
DALLAS
AUSTIN
LITTLE ROCK
TEXARKANA
ATLANTA
VALLEY FORGE
CAMP HILL
COLUMBUS
CINCINNATI
BURLINGTON
AVON
BOSTON
BUFFALO
HARTFORD
NEW YORK
WILMINGTON
WASHINGTON D.C.
RICHMOND
RALEIGH
WHITEVILLE
COLUMBIA
ORANGEBURG
FORT LAUDERDALE
MIAMI
SAN JUAN
INVENTORY
● 86 COMPUTERS
● 10,652 COMPONENTS

EXHIBIT 3

COMMUNICATIONS NETWORK


SEATTLE
PORTLAND
SAN RAFAEL
SAN FRANCISCO
SACRAMENTO
STOCKTON
OAKLAND
FRESNO
SANTA BARBARA
BAKERSFIELD
SAN BERNADINO
LOS ANGELES
SAN DIEGO
PHOENIX
ALBUQUERQUE
EL PASO
AUSTIN
SAN ANTONIO
DALLAS
MINNEAPOLIS
DES MOINES
MADISON
CHICAGO
PETOSKEY
GRAND RAPIDS
ANN ARBOR
COLUMBUS
INDIANAPOLIS
CINCINNATI
LITTLE ROCK
ATLANTA
BUFFALO
CAMP HILL
BOSTON
HARTFORD
NEW YORK

Technical Planning

The technical planning group provides the following Corporate Services:

1. Overall direction for equipment planning.
2. Technical assistance for total Corporate Planning.
3. Analysis of new technology.
4. Marketing support in the areas of:
    - Sales Presentations
    - Sales Study Support
    - Costing of Computer Requirements, Data Preparation, Microfilm, and Supply Services
5. Maintain and negotiate vendor contracts for equipment and software.
6. Procure equipment and services.
7. System Measurement Services.
8. Accounting reports for Data Center costing.
9. Maintain, analyze, and revise the communication network (see following explanation).

Communication Network. The design, analysis, and revision of the EDS Communication Network is the responsibility of Corporate Technical Planning.

Networking is a highly complex subject which dictates intricate analysis of many factors before an optimum solution can be derived. Some of these factors are:

1. Tariffs - WATS, TEL PAK, DDD, HI-LO, etc.
2. Message - Type, Length, volume, arrival rate, etc.
3. Structure, Multi-drop, Time Division Multiplexors, Frequency Division Multiplexors, concentrators, etc.
4. Mode - Video, Hardcopy, graphics, unsolicited, etc.
5. Lines - Point to Point, Multipoint, Dial-up, Speed, Full Duplex, etc.
6. Terminal - Speed, Keyboards, Display, Clustering, etc.
7. Response Time - How Fast, Mean, Probability distribution, etc.

To help with this complex task, we make use of several models to analyze mathematically the network requirements and subsequently construct multipoint circuits connecting remote terminals to a data center. These models combine network requirements with real-world performance data collected from the EDS On-Line System to achieve the required performance. The resulting data is then analyzed, and a relationship between user requirements and communication system cost is established to arrive at an economical design. The objective then, is to select and combine subsystems and circuits which allow us to achieve the required performance at the least cost.

The EDS Network currently contains in excess of 100-high speed AT&T circuits.

Hardware Management

The responsibility of the hardware management group is to evaluate, designate, and coordinate all computer hardware within EDS by providing the following services:

1. Central point for vendor hardware support.
2. Prepare and maintain consolidated equipment plan.
3. Maintain on-order inventory.
4. Coordinate regional hardware representatives.
5. Verify costing estimates.
6. Prepare and maintain all computer configurations including:
    - Floor plans.
    - Power requirements.
    - Air conditioning requirements.
    - Addressing schematics.
7. Coordinate all movement of hardware within EDS. By way of reminder, EDS' current inventory includes 86 computers and 10,652 uniquely identifiable components.

Software Support

Software systems development in EDS follows the same general type experience as in the systems development and maintenance. For a company in the facilities management business, the size of EDS, with the major hardware, operations, and applications programs, it is mandatory that EDS offer direct software development and maintenance internally to support the customer applications. Each of the major computer centers is coordinated by this central group in order to keep common operating systems software available.

This provides for mobility of personnel among centers and off-loading or transfer of accounts between centers in order to achieve a balance in the utilization of hardware and support facilities.

This function is divided into four distinct areas providing the following corporate services.

1. Data Center Support

Operating System Support

- Maintain software systems via specialists in system maintenance.
- Maintain commonality across data centers in operating systems, software enhancements and maintenance levels.
- Test new system software in controlled environment prior to release to field.
- Central point for major vendor support.
- Eliminate the 're-invention of the wheel' syndrome-problem corrected once.

Data Center Operations Support

- Maintain commonality in the operation of Data Centers.
- Provide operational Aids - common data set management tools and procedures for:
  (1) Disk allocation and usage control.
  (2) Tape library maintenance.
  (3) Program library maintenance.
- Provide common system accounting and reporting systems.
- Provide common measurement tools tailored for our operating environment.

2. Systems Engineering Support

System Engineer Utilities - maintain commonality across data centers in area of S.E. operating procedures affording relocation to a like environment. Included are such areas as:

- Naming conventions.
- Common procedures.
- Standard form of macros.
- Standard utilities.

- File access techniques - provide support for internally developed file access methods.

- Text Editor - provide support for the On-Line Text Edit application and supporting operational type utilities.
- Analyze and recommend new software products pertaining to utility usage.

3. On-Line Systems

   - The analysis and development of communication based systems is the responsibility of this group.
   - The main emphasis is on the continual development of the proprietary EDS On-Line System (OLS). This system is a high-performance, general purpose communications interface between remote terminal devices, the IBM 360 or IBM 370 Operating System, and the user-written application programs. The control section of the EDS On-Line System performs all I/O operations within the communications network and maintains the responsibility for routing inputs and outputs to and from remote stations and the proper application programs. The capability of controlling lines and terminals in various ways to reflect particular system requirements is vital to a generalized on-line environment where many different types of applications are operating concurrently.

4. Future Systems

   - Evaluate and benchmark new operating and support systems.
   - Plan the migration to new operating systems and new operating environments.

Microfilm, Forms and Supplies

Microfilm Services. Microfilm includes:

16mm microfilm (cartridge or reel)
105mm microfiche
COM Processing services
Miscellaneous COM supplies
Source document filming
Duplicating
Services include all aspects of Computer Output Microfilming:

1. Conversion of magnetic tape output in either 800 or 1600 BPI to any microfilm medium.

2. Twenty-four hour turnaround from time of receipt to time of return is available.

3. Output tailored to the customer's needs, including 16mm, 35mm, 70mm, 82.5mm, microfilm; or 105mm microfiche.

4. Regional processing for faster turnaround. Centers are located in San Francisco, New York, and Dallas.

5. Source document filming or COM work including duplicating as well as processing capabilities.

6. Cartridge or reel loading and indexing.

7. Backup processing is available.

Forms and Supplies. Supplies include:

Stock and custom continuous forms
Stock and custom punched cards
Computer printer ribbons
Magnetic tapes
Disk packs
Continuous labels and miscellaneous items

Service Corporation also:

1. Designs or assists with the design of continuous forms at the customer's request.

2. Controls inventory levels on all continuous forms and supplies.

3. Handles all contracts with vendors and negotiates contract agreements.

4. Provides emergency deliveries, if necessary, to insure that the project will not run out of an item.

5. Travels to installations upon request to help resolve problems which may arise.

6. Pursues all quality complaints with respective vendors.

7. Provides a single invoice to the customer each month which includes all supplies.

8. Has someone available at all times to answer questions or process telephone orders.

9. Upon signing supplies agreements, buys the customer's existing inventory (and on-order shipments) to relieve him of further commitments.

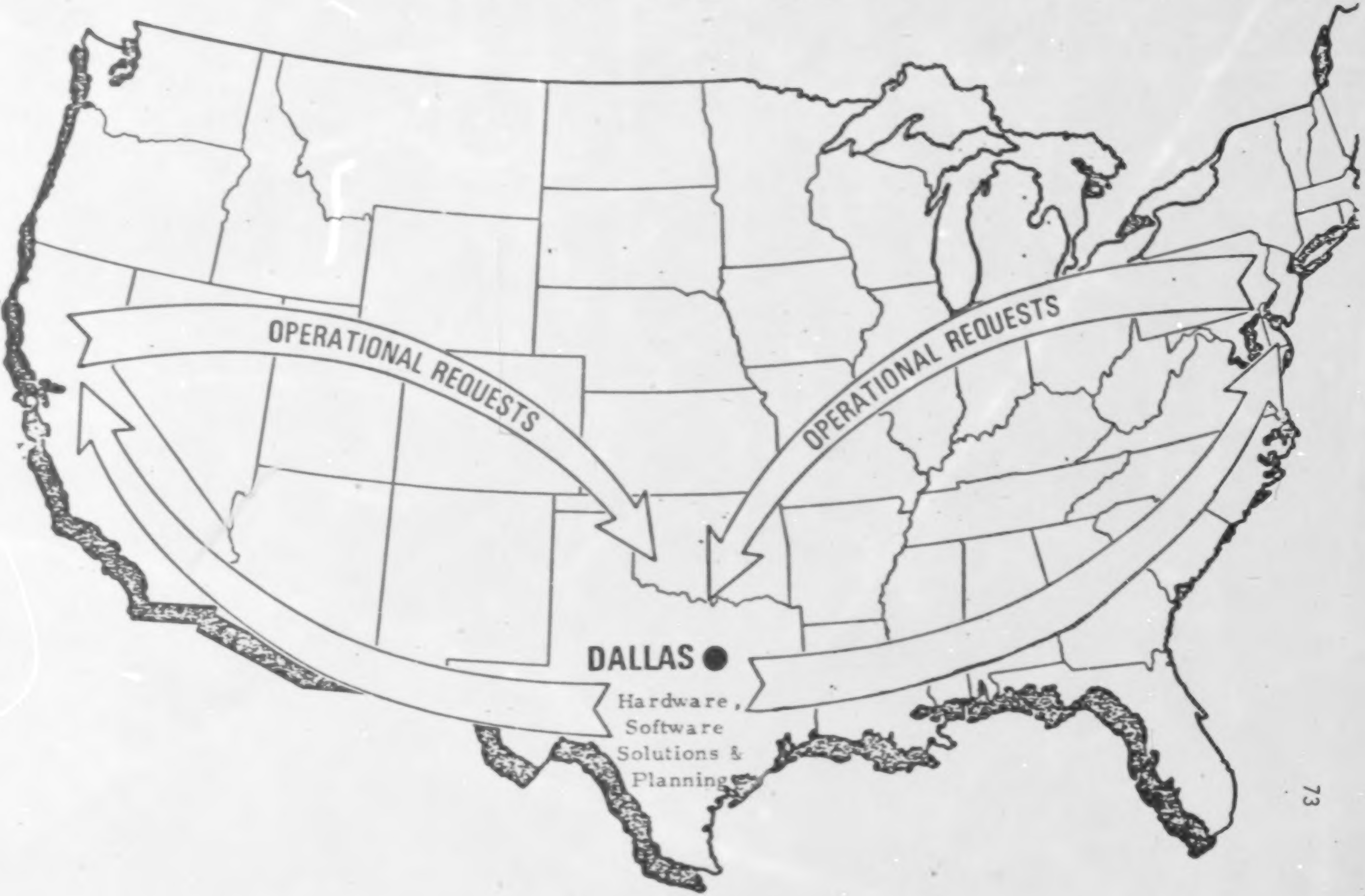
Data Preparation Services

Data Preparation Services is responsible for the complete management of the hardware, software, and people used in the initial conversion of source documents to machine readable format.

Its responsibilities include the following individual items:

EXHIBIT 5

CORPORATE SERVICES SUPPORT


OPERATIONAL REQUESTS
OPERATIONAL REQUESTS
DALLAS
Hardware, Software Solutions & Planning

1. Equipment selection and software development.
2. Individual performance measurement tools, salary administration, and incentives.
3. Work simplification.
4. Labor relations.
5. Developing and maintaining work measurement tools.
6. Industrial Engineering support.
7. Was responsible for the keying of over 140 million records in 1974.
8. Operator and supervisor training.
9. Quality control.
10. Budget analysis and cost control.

Summary

As was pointed out earlier, it is extremely important to the success of Corporate Services that there be effective communication among the various groups within Corporate Services. Even more important is that there be effective communication between Corporate Services and the remote regional centers. To solve this potential problem, highly qualified hardware and software trained Systems Engineers have been assigned as regional representatives to SPEAK for the remote sites. Their functions include some of the following:

1. Be intimately aware of the regional center's operating environment.
2. Be aware of the current needs of the regional center and project future needs.
3. Cost justify hardware and software requests.
4. Finally, as true spokesmen for the regional center, to interface with Corporate Services regarding requests for technical change.

Academic Emphasis for the Future

The Computer Science curriculum that I have reviewed seems to cover the technically oriented training of students fairly well. Programming languages, addressing schemes, system analysis, real-time computing, future concepts and other topics are mandatory subjects to be learned. However, I feel that more emphasis needs to be placed on the real basics. Why compute at all? Once you do, what's the best (most economic) way to do it? In other words, the Economics of Computing. Listed on the following page are some of the areas that should be addressed. These areas could be covered either within the computer science department or perhaps due to broad business interest, in some other area of a business curriculum.

1. The economic justification of computing.
2. Lease plans, short-term/long-term.
3. Lease/purchase considerations.
4. Depreciation methods versus technical obsolescence.
5. Investment tax credit.
6. Vendor evaluation.
7. Teleprocessing tariffs, inter-intra state, etc.

Panel Discussion

Jarrell Grout, Head
Department of Computer Science
Stephen F. Austin State University
Nacogdoches, Texas

Grout: Mr. Cogan said, in review, that the technically oriented training is well covered in the computer science curriculum. I am glad to hear this. Secondly, however, more emphasis should be placed on the economics of computing. I would like to list some ways in which, I feel, computer science educators may be meeting this need. First of all, I was glad to see a statement in the paper and I quote, "The function of data processing in business is to enable a company to provide their products and services to its customers for a minimum cost." In other words, cost effective performance is an important concept to stress to students; we do stress it, and I am sure the same is true at other schools. However, the overall computer science programming tactic is to allow students to get a broad education and to couple this broad education with technical computer science knowledge so that they have a foundation for professional competence, an idea which is not foreign to what has been discussed in previous panels. Broad education encompasses areas other than computer science. So we are looking at not just the computer science curriculum, but other areas such as business and economics, liberal arts, mathematics, natural science, and communications. A few specific courses in the computer science area can be used as vehicles to present, and therefore meet the needs for coverage of computing economics. Some of the computer science programs I am familiar with have computer science courses which are oriented in this direction; some are not. In our case, we do cover some items which were mentioned in a course called Systems Analysis Design, such as economic analysis, cost effective analysis. Another course called Computer Center Management touches on these topics as they relate to management of a computer center. These ideas are being taught, and I believe that we try to be accurate. I suppose I am approaching this from the fact that Dennis has talked about EDS and their very complex organization from the management standpoint. I believe he has presented a need for teaching material related to economics or the economics of our future needs which basically have been recognized. Thus, I am focusing on that one idea.

Even though some of our students are acquainted in various courses with economics related to computing, I believe it will be necessary once they graduate for them to spend time working in a company where there is more economic emphasis. They may not understand everything that is covered in school, but they will understand it better once they spend some time with the company. I suppose what we need to do in the university is to develop a specific course in the economics of computing; and to make it more meaningful, we need someone from industry to teach the course for us.

I presented your (Cogan's) paper to my Computer Center Management class and asked them to make responses. I would like to relay those responses to you. One, when you are engaged in facilities management, which standards do you use, those of EDS or those of the user company?

Cogan: It is really a two step problem. We start a facilities management contract with the corporation. Quite often EDS then becomes the data processing department for that corporation. The day that happens there is very little change of an EDS oriented nature, other than the management steps and things like that. They have their own data center set up and presumably running with some degree of success. At that point we can't start forcing any of our own standards. Quite often the company evolved a set of their own standards. One of the long-term things we try to do to improve benefits to everyone involved is to combine small data centers to giant computer centers just to make use of the economy of skills. In order to do that we are constantly looking at migrating a remote data center, both through operating systems, procedures, and things like that, to a point that the regionalization only requires putting in the teleprocessing lines, moving the programs over and setting up the procedures, as opposed to rewriting programs, generating operating systems, and putting all kinds of fixes on the operating system to support application problems that had not previously been encountered.

Grout: The second question asked was: Won't the employees become more EDS oriented rather than company oriented? Won't they lose sight of the user company's objective?

Cogan: The main emphasis on the presentation that I made was that part of the corporation is more technically oriented than the market force or the corporate services. About 3,500 people work for EDS, and the total corporate services unit has 800 people. The majority of the rest of the people are the application oriented SE's. While one group here is providing centralized technical support to solve technical problems for all kinds of industries, we have separate groups of people that are insurance experts, banking experts, retailing experts, etc. So as far as the people in corporate services are concerned, they are more technically oriented than they are industry oriented. By the same token, all the evaluations of new products and new technologies quite often are addressed to the particular industry. For instance, there are people looking very hard at areas of the 3600 terminal for financial applications and point-of-sale terminals and supermarket terminals. So from that point of view they are taking a technical look at new hardware and software technologies that are pointed at a particular industry.

Grout: Here we are talking about the advantages of a teleprocessing network. EDS software and facilities pose very complex management situations. I wonder from our standpoint, how can all of these concepts be included in a computer science curriculum. What should be covered? What level of students should be involved in such courses? Should it be included at all? Who should teach that kind of course?

Cogan: Yes, I think so. EDS can get fairly complex. I think the management skills that would be appropriate for any company would apply to EDS. It can get fairly intense at times, and things can move very rapidly. However, I think it always falls back to the basic management skills, which boils down to emphasizing the importance of communication. I do not think there is any real difference in managing this kind of operation; it is just a situation where those basic skills must be applied very well, and if they are not, it is quickly seen. As far as who should teach it, the same kind of people who teach basic management skills in any area of the business curriculum should serve as instructors.

THE PHARM-ASSIST SYSTEM

J. M. Dismuke
Octal Systems, Inc.
Euless, Texas

INTRODUCTION

The Pharm-Assist System is a specialized computer system providing on-line computer services to retail pharmacies. Services are being provided to about 120 pharmacies by the Texas system, based at Euless, Texas. This system has been operational since September, 1971 and serves pharmacies as far away as Galveston and Oklahoma City. A second system, installed in mid-1974 in Palo Alto, California, presently has about 55 pharmacies on-line.

THE SYSTEM CONCEPT

The system concept used by the Pharm-Assist System was developed in 1970 to provide low-cost, on-line (time shared) computer services to small businesses. The concept utilizes a central mini-computer for data base and file management and remotely located satellite mini-computers for teleprocessing. This concept provides broad geographical coverage, allowing a sufficient volume of customers to be installed, while achieving realistic market penetrations (10% or less). The design objective in 1970 was to be able to provide on-line service "packages" in the price range of 100-400 dollars.

The important technical advantages of the concept are that it provides for the centralization of peripherals, personnel and work, while sharing the cost of long distance lines over a large number of customers.

THE PHARM-ASSIST SERVICE

In the pharmacy, a computer terminal is used for data entry and printout. The terminal, a selectric type similar to a 2741, is connected via leased telephone line to the satellite computer. During prescription operations a special roll label form is used. Each form has a work area and a label area.

The prescription operation begins with a new prescription. The Pharmacist, working interactively with the terminal, enters into the computer all of the information pertinent to the prescription. The amount of typing done by the Pharmacist is about the same as that done when manually typing a label. The computer then:

1. assigns the next prescription number to the prescription;

2. prices the prescription according to the medication cost, quantity and the Pharmacy's own pricing schedule;

3. prints out a label (free of strikeovers) to be affixed to the prescription vial; and

4. sends the prescription record to the central computer to be stored for subsequent usage.

Once the prescription has been stored by the computer, other operations may be done with very little clerical effort. Using the terminal, the Pharmacist can:

1. refill the prescription by entering only the prescription number;

2. print out one or more extra labels for a prescription; and

3. review all medication currently on file for one customer.

For each operation, such as a new or refill prescription, a transaction record is generated within the system. These transaction records are used to generate reports and third party billing. Using the terminal, the Pharmacist can:

1. print a daily record of all transactions for the day, with totals of costs, fees, and prices.

Two reports are generated periodically at the Central System. These are:

1. Drug Usage - a monthly report which provides quantities of each medication sold plus statistical data. This report is used by the pharmacy in reordering medications and is used much as inventory control reports would be used; and

2. Patient Prescription Profile - a quarterly report which lists, for each customer, all prescriptions received during the quarter.

The transaction records also are used to generate third party billing, such as welfare prescriptions. Presently, the Pharm-Assist System does third party billing for:

1. Texas State Welfare - weekly, for Texas Pharmacies, welfare transactions are accululated and sent, on magnetic tape, to the Department of Public Welfare in Austin, to be processed directly by their computer (370-155);

2. California State Welfare - weekly, for California Pharmacies, welfare transactions are accumulated and printed on special forms. The forms are returned to the pharmacy for additional clerical work prior to submission to the payer; and

3. Texas Blue Cross - weekly, for pharmacies in the Dallas/Ft. Worth area, claims are accumulated and printed on forms. The forms are submitted to Blue Cross of Texas on behalf of participating pharmacies.

Claims processing for other third parties is in work, and two, Metropolitan Life of New York and Pharmacy Claims Services of Phoenix, are national and will be submitted on magnetic tape.

ADVANTAGES TO THE USING PHARMACY

The typical pharmacy dispenses about 900 prescriptions per week, of which about 150 are paid for by a third party. About 475 of the prescriptions are refills (55% of the total). Although the typical pharmacy may be open for business at least twelve hours per day and six days per week, most of the prescriptions are dispensed in a few "peak-period" hours per week.

The increased speed of the Pharm-Assist Service in processing prescription refills and third party claims frequently means that the using pharmacy may require no additional personnel to handle the "peak-period" workload.

There also are some cost savings to the using pharmacy:

1. Medication costs have generally increased. The Pharm-Assist Service provides more current data on costs of medications than the typical store can maintain (averages 10-20 cents per prescription).

2. Drug Usage data from the Pharm-Assist Service allows a smaller inventory and better purchasing control.

3. Third party claims processing by the Pharm-Assist Service means faster turn-around and fewer rejected claims (especially where magnetic tape is used) resulting in a significantly improved accounts receivable position.

Increased productivity and improved management information can help a pharmacy to better meet competition or simply to make more money or simply to stay in business longer.

THE ON-LINE SYSTEM

The on-line system, as it has been implemented in the Pharm-Assist application, has four major functional components. These are:

1. the Central computer;
2. the Satellite computer;
3. the off-line (support) computer; and
4. the terminal/telephone equipment.

CENTRAL COMPUTER

The Central computer provides the primary data base for the on-line system and most of the file management functions. It includes an HP-2100 CPU with 16K words of core memory and a number of 22 million character disk drives (10 for the Texas system, 4 for the California system). Other peripherals are magnetic tape units, line printer, photoreader, console typewriter and communications multiplexer.

Software for the Central system is all especially developed and written in Assembly Language. A minimal operating system (including I/O drivers, Executive and some utilities) is utilized, to provide some growth potential. The Executive allows the resources of the CPU to be task-shared rather than time-shared, a concept that was highly innovative in mini-computers in 1970 when the system was designed.

The present design of the Central system would seem to be adequate to support several hundred pharmacies on several satellites. The limitations appear to be in operational or geographical areas rather than areas of real-time performance.

SATELLITE COMPUTER

The Satellite computer provides the teleprocessing for the on-line system. Unlike other distributed (Central/Satellite) systems (such as a 370 main frame with a "soft" front end), this Satellite is the main computer. It provides direct control of each terminal, and essentially executes a separate program for each terminal. This direct operation significantly improves the performance of the system and allows the long distance telephone line to be shared by a large number of users without objectional delays.

The Satellite is designed for remote, autonomous operation, hence has few peripherals. The hardware consists of an HP2100 CPU with 16K words of core memory, an HP7900 disk drive with a capacity of 5 million characters, and one to four CM16 Communications Multiplexers, each with 16 ports.

Software for the Satellite computer is similar to that for the Central computer, but is designed to support a larger number of ports. The executive has four core resident module overlay areas and 45 core resident swap areas which may be dynamically assigned to a working port.

OFF-LINE COMPUTER

The off-line computer is simply a small, batch system used to generate reports and other outputs from transaction data derived on line. Its components are the same as the Central computer (except for using an HP-7900 disk drive), which is useful backup in the event of a hardware failure. The off-line computer uses a vendor supplied DOS operating system and most of the programming is done in FORTRAN IV.

TERMINAL/TELEPHONE EQUIPMENT

The terminal presently used for the Pharm-Assist service is a Selectric based terminal similar to a 2741. It operates at 135 baud and uses Industry Standard Correspondence Code. The modems, or data sets, used to connect the terminal and CM16 Multiplexer to the telephone lines are Industry Standard Shared Line Adapters. These are characterized by using the same carrier frequency for transmit and receive and, hence, are less expensive than other types. The telephone lines are voice-grade, multi-drop lines, again less expensive than lines used with faster, more sophisticated terminals.

INNOVATIONS OF THE SYSTEM (1970)

When the on-line system was designed in mid-1970, the system was innovative in several respects:

Distributed System

The concept of a distributed system with the Satellite computer as the main CPU was innovative in 1970. The concept had significant advantages:

1. The system uses mostly local, all low-grade telephone lines;

2. The smallest classes of mini-computers can be effectively used;

3. Each terminal is directly supported as in some kinds of time-shared system or as with intelligent terminals;

4. Long distance lines are shared by many users (up to 60 or so);

5. Failure of one CPU will cause only a limited number of terminals to be inoperative or degraded operation for all terminals (no retrieval of previously stored data);

6. Software for each Satellite may be customized if desired and updates may be made for one Satellite or all Satellites; and

7. Most personnel costs are associated with the Central but some functions can be effectively assigned to the Satellite level of operation (e.g., customer service or programming support).

Hardware

The communications multiplexer developed for the on-line system uses separate cards (strappable for speed and code set) for each port and full character buffering. A port card, for example, can be replaced, on-line, without affecting the operation of other ports.

Software

The programming concept developed for the on-line system utilizes port oriented task-sharing of CPU time, rather than time-sharing. The executive uses multiple module (program overlay) areas with fully re-entrant modules and dynamically assigned core-resident swap (for pointer stack and saved data) areas.

NEEDS FROM THE ACADEMIC COMMUNITY

In developing and operating a computer system such as the Pharm-Assist System, many new or different requirements are placed upon the personnel involved. Most of these requirements have been met (by Pharm-Assist) by the utilization of high skill level engineering personnel from the Aerospace Industry.

The academic community can help in meeting these (and future) requirements by:

1. Better balance in the curriculum between the theoretical (theory of data base management, etc.) and practical (mini-computers, assembly language, telecommunications, etc.) aspects of computer science;

2. Keeping the university's own computer equipment on a par with the typical business application (not the most advanced business application);

3. Emphasis on the development of standardized, usable, business oriented programming languages and software; and

4. Taking a leadership position in development of industry wide standards for the computer industry (e.g. Why shouldn't all paper tape readers for mini-computers have a standard electrical interface something like RS-232 standards?).

```
NUM          MILES       8      16      24      32      40      48      56      64

 1 SAT          25   112.50   56.25   41.67   31.25   27.50   22.92   21.43   18.75
 1 LNG LINE     25    30.12   30.12   25.96   27.00   27.62   25.96   26.55   27.00

 2 SAT          50   125.00   62.50   45.83   34.37   30.00   25.00   23.21   20.31
 2 LNG LINE     50    42.62   42.62   34.29   36.37   37.62   34.29   35.48   36.37

 3 SAT          75   137.50   68.75   50.00   37.50   32.50   27.08   25.00   21.87
 3 LNG LINE     75    55.12   55.12   42.62   45.75   47.62   42.62   44.41   45.75

 4 SAT         100   150.00   75.00   54.17   40.62   35.00   29.17   26.79   23.44
 4 LNG LINE    100    67.62   67.62   50.96   55.12   57.62   50.96   53.34   55.12

 5 SAT         125   162.50   81.25   58.33   43.75   37.50   31.25   28.57   25.00
 5 LNG LINE    125    80.12   80.12   59.29   64.50   67.62   59.29   62.27   64.50

 6 SAT         150   175.00   87.50   62.50   46.87   40.00   33.33   30.36   26.56
 6 LNG LINE    150    92.62   92.62   67.62   73.87   77.52   67.62   71.20   73.87

 7 SAT         175   187.50   93.75   66.67   50.00   42.50   35.42   32.14   28.12
 7 LNG LINE    175   105.12  105.12   75.96   83.25   87.62   75.96   80.12   83.25

 8 SAT         200   200.00  100.00   70.83   53.12   45.00   37.50   33.93   29.69
 8 LNG LINE    200   117.62  117.62   84.29   92.62   97.62   84.29   89.05   92.62

 9 SAT         225   212.50  106.25   75.00   56.25   47.50   39.58   35.71   31.25
 9 LNG LINE    225   130.12  130.12   92.62  102.00  107.62   92.62   97.98  102.00

10 SAT         250   225.00  112.50   79.17   59.37   50.00   41.67   37.50   32.81
10 LNG LINE    250   142.62  142.62  100.96  111.37  117.62  100.96  106.91  111.37

11 SAT         275   237.50  118.75   83.33   62.50   52.50   43.75   39.29   34.37
11 LNG LINE    275   155.12  155.12  109.29  120.75  127.52  109.29  115.84  120.75

12 SAT         300   250.00  125.00   87.50   65.62   55.00   45.83   41.07   35.94
12 LNG LINE    300   167.62  167.62  117.62  130.12  137.62  117.62  124.77  130.12

13 SAT         325   262.50  131.25   91.67   68.75   57.50   47.92   42.86   37.50
13 LNG LINE    325   180.12  180.12  125.96  139.50  147.62  125.96  133.70  139.50

14 SAT         350   275.00  137.50   95.83   71.87   60.00   50.00   44.64   39.06
14 LNG LINE    350   192.62  192.62  134.29  148.87  157.62  134.29  142.62  148.87

15 SAT         375   287.50  143.75  100.00   75.00   62.50   52.08   46.43   40.62
15 LNG LINE    375   205.12  205.12  142.62  158.25  167.62  142.62  151.55  158.25

16 SAT         400   300.00  150.00  104.17   78.12   65.00   54.17   48.21   42.19
16 LNG LINE    400   217.62  217.62  150.96  167.62  177.62  150.96  160.48  167.62



 COMPARISON OF VARIABLE COSTS - SATELLITE VS LONG LINES
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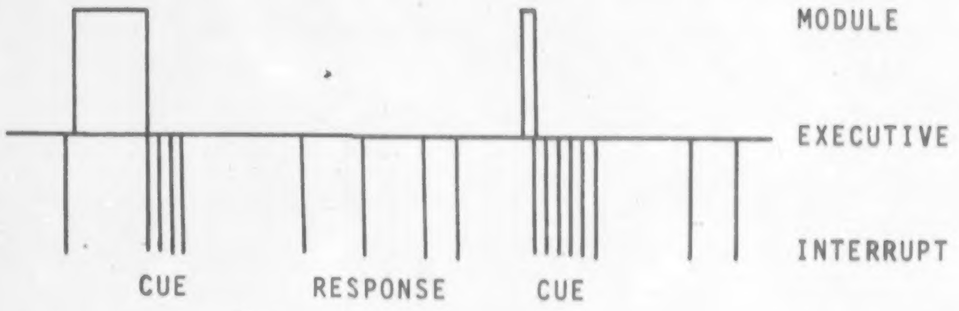
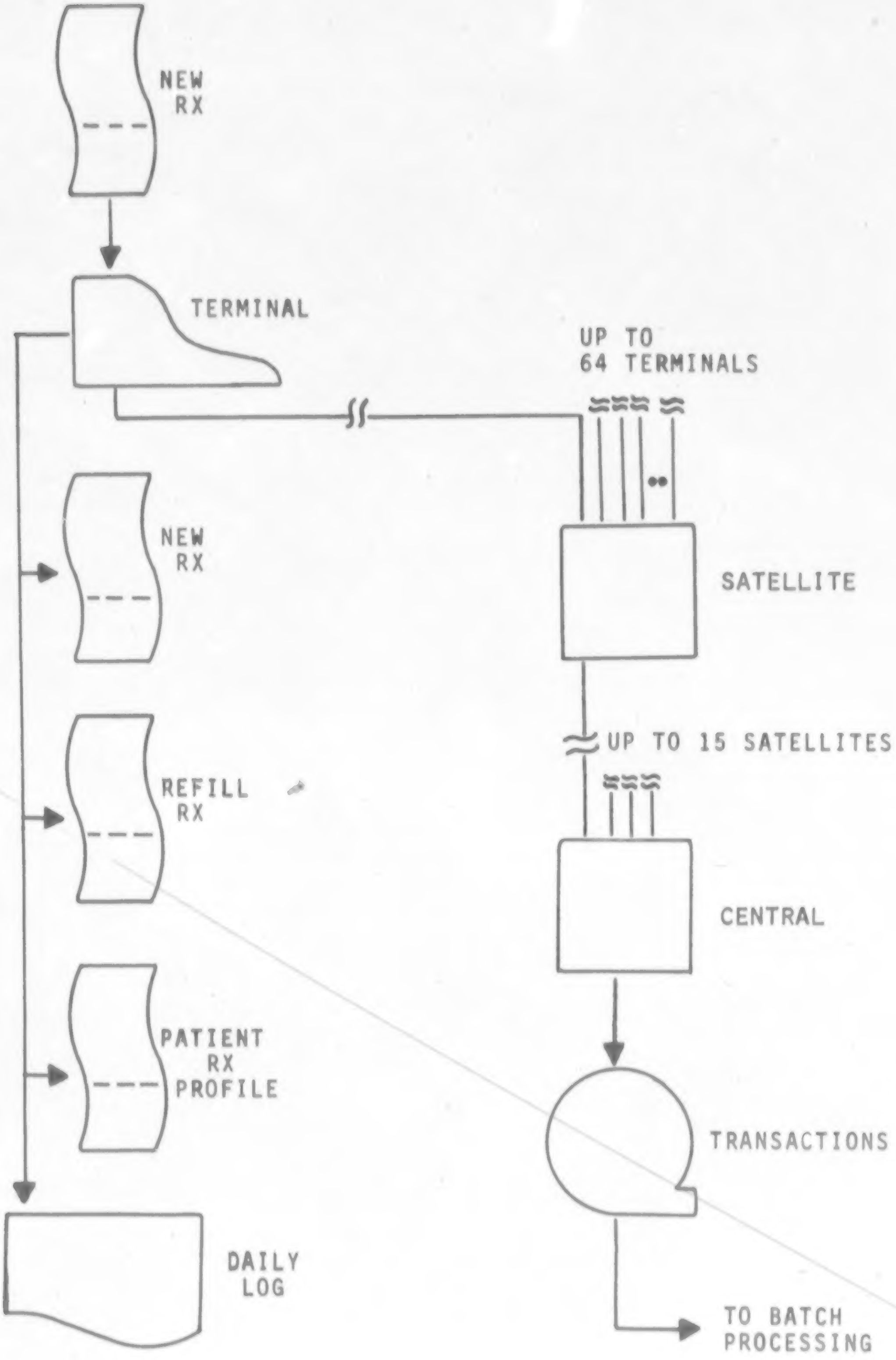

MODULE
EXECUTIVE
INTERRUPT
CUE
RESPONSE
CUE

SOFTWARE PROGRAM STATES


NEW RX
TERMINAL
UP TO 64 TERMINALS
NEW RX
SATELLITE
UP TO 15 SATELLITES
REFILL RX
CENTRAL
PATIENT RX PROFILE
TRANSACTIONS
DAILY LOG
TO BATCH PROCESSING

PHARM-ASSIST DATA FLOW

Panel Discussion

Melvin Pierce
Director of Computer Center
Associate Professor of Computer Science
University of Texas at Arlington
Arlington, Texas

Pierce: It seems as if the government is always looking for projects to fund that involve minorities. As Jim has pointed out here, he is in the minority as far as the rest of the papers are concerned; so maybe he should apply for some kind of minority funding for computer systems.

I personally have been involved in industry, having worked at General Dynamics for about seven years; so I feel that I understand some of the problems that industry has, though I have been at the University of Texas at Arlington for about fourteen years. I do keep in contact with industry on a regular basis, trying to keep up with their needs. Someone suggested earlier having an internship for professors; I would thoroughly welcome that if I could find an industry that would take me on in that respect.

Regarding this particular pharmacist system, I have been very impressed by what appears to be an innovative approach to a problem that needed a solution. These people have taken standard, relatively inexpensive hardware and put it together in such a manner as to solve a rather large application problem. Some people might say it can't be done, but I feel like they have done it. It is a very impressive system to me. As a result of exposure to this and other similar projects, such as Hotel Computers Incorporated in Fort Worth, which go into a specialized industry, use a small minicomputer, and meet the needs of that small segment of industry, I feel that this may be the way things are heading in the future. In education we want to be involved in that new trend, and if not involved, at least prepared. At the University of Texas at Arlington we have instituted some courses in minicomputer programming and minicomputer architecture, at the Master's degree level primarily. To give a little background, we do not offer a bachelor's degree in computer science; we only offer a minor at the bachelor's degree level, then a Master's degree in computer science. We at the University of Texas at Arlington are under some pressure from students to offer a bachelor's degree in computer science, as many other universities are doing. However, our feeling is that industry needs the equivalent knowledge of a major in some application area before a student will be of too much value to them. We may be wrong on this particular point, and this is some input we would like to have. I would like Mr. Dismuke to address this question in just a moment. We do want to know how industry feels about this. We at UTA are trying to accomplish the following things with regard to our computer science minors and Master's students. We want to train:

1. programmers
2. systems analysts
3. computer center managers
4. professionals rather than technicians.

Most important, we are trying to train people to think, instead of being robots. Jim, could you comment on the following:

1. What do you desire for students at the bachelor's degree level?
2. What do you desire for students at the Master's degree level?
3. Is a computer science major needed in your area of industry?

Dismuke: Primarily we are in the engineering business, so our needs are people who have a good understanding of hardware, the way hardware works, as well as software, and how the software works. We are systems people. Consequently, I think we need a better mix between theoretical studies and practical, down-to-earth studies like assembly language programming, how the computer uses two 16-bit words, adds them, and what the results are. I feel that people we have talked to who come from the academic community are either too theoretical, that is, they are over-qualified for the jobs we have available, or alternately, they do not have enough hands-on experience and specific skills related to the concepts we use.

Ward: I asked Jim to come because I felt that what he has to say is going to be very important to a lot of our academic curriculums in the near future. Technology is advancing at such a rate that I am not completely sure where we are going to stand if we continue our academic computer science programs in the same veins that they have been separated into for the last five years. Our standard three traditional routes that a student can go may not satisfy future needs. Jim brought up the touchy question of hands-on experience. I know all of us have that problem in our academic computing environment. I do hope you will take his remarks, consider them, and try to pursue his suggestions.

DISCUSSION FROM FLOOR

Qualline: I have a great deal of empathy for Mr. Dismuke since I was associated with two small computer businesses before I became an academician. I would like to state first that we at East Texas State University do offer a course in mini- and microcomputers. However, I would question whether we are able to prepare people for your particular type of operation or for any small business. It is my opinion that if we turn out people who are well versed in the fundamentals, you cannot really afford to take them. It seems that you would like to have someone who is well trained in fundamentals and has two years of experience with some large company. I wonder if that is correct.

Dismuke: (nodded his head yes.)

Oualline: You do. I am also pleased to see someone from the non-data processing end of computer science here. I would like to know just what we can do beyond concentrating on fundamentals, not necessarily theoretical. We would like to give as much hands-on experience as our equipment will allow us; but in order to get our people employed, we tend to give them an orientation toward a large shop. Let EDS or some other large company employ and train them, then you can steal them. So we can give them a course in minicomputers, microcomputers, and teach them how to add two 16-bit words; but that appears to be as far as we can go. How do you feel about that?

Dismuke: While that is basically correct and that is where we do get most of our people, it is simply because, up to this point, the students who have come out of the academic environment have had neither hands-on experience of any kind nor any exposure to minicomputers or to the hardware itself. In other words, "How does a tape drive actually work? What do you mean when you say 1600 bpi, 9-track, phase encoded industry standard?" These kinds of things are very important from a small business standpoint because we cannot afford the learning curve. We see no reason why a person should not be effective within a very short period of time, like a four-week training course. I see no reason why it should take him longer than that to learn to program on an HP computer.

Gensler: You said that you felt this type of computing and this type of technology, are the way of the future. I really don't agree with that. I think the type of thing you are doing provides a needed service. But I think as time goes by and this type of computing proliferates, you are going to find these same people in the same paper crunch as before because they are going to have four or five different systems that they are using one for their prescriptions, one for their bookkeeping, and one for their tax reporting. Suddenly they are going to be confused again, and they will want to consolidate those efforts which are on six different computers with six different operating systems and six different word sizes; they are going to be in trouble.

Dismuke: That is a definite possibility but my point was that hand-held calculators today cost approximately $20, and they are one-fourth as complex as a data entry device for a computer. Ten years from now there is no reason why everyone in the country could not have very sophisticated terminals in his hands. This terminal could be connected to anyone of a thousand computers, but that will not be a big machine. A big machine could not support that concept; it will have to be a series of small, teleprocessing oriented computers rather than EDP, RJE type batch processors.

Gensler: I still think that those computers will be nothing more than message switchers for a large computer.

Dismuke: Possibly.

Ward: In closing, I want to leave the academic people with a little food for thought. I am in agreement with Jim in a lot of areas. I am reminded of a story I heard recently about a small boy who was envious of a large boy's size because the big boy could grapple with the big bears in the woods. The big boy replied that there were a lot of little bears in the woods that he could face. So you academic people in computer science, be careful.

EAST TEXAS STATE UNIVERSITY

The Computer Science Department took great pleasure in conducting the much needed Computer Users Conference. On behalf of the planning committee, we thank the following sponsors for making both the Conference and the Conference Proceedings possible.

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THINK

Think
Very simple advice—yet incredibly important.
Because those who do, make it.
Those who don't, don't.
Think about it.

IBM

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Southland is proud to have been a sponsor of the East Texas State University Computer Users Conference. Our contratulations to the Department of Computer Science for the combining of representatives from the academic and users groups into informative panels.

We salute
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and
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